SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,KARUKUTTY

Grants received from Government and non-governmental agencies for research projects / endowments in the institution during 2021-2022

SL NO:	Faculty Name	Department	Sanctioned by	Sanctioned for	Sanctioned amount	Current Status
1	Ms. Remya Y K	Civil Engineering	CERD_KTU	Research work	120000	Ongoing
2	Vinoj P G	ECE	CERD_KTU	Research work	75000	Completed
3	Hazel Elza John	ECE	KSCSTE	Research work	9800	Completed
4	Rosebell	CSE	CERD_KTU	Research work	49,860	Completed
5	Deepasree varma	CSE	SERB DST	Research work	1,664,000	Ongoing
6	Deepasree Varma	CSE	RajCOMP Info Services Ltd	Research work	755,000	Ongoing
7	Susmi Jacob	CSE	CERD-KTU	Research work	75,000	Ongoing
TOTAL SANCTIONED AMOUNT SANCTIONED FOR RESEARCH WORK BY GOVERNMENT AND NON-GOVERNMENT AGENCIES 2021-2022						**2748660**

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY KARUKUTTY ERNAKULAM 683 576

PRINCIPAL
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
VIDYANAGAR, PALLISSERY, KARUKUTTY
ERNAKULAM, KERALA-683 576

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CET campus, Thiruvananthapuram - 695 016
Ph: 0471 2598122; Fax: 2598522 www. ktu.edu.in Email: university@ktu.edu.in

No. KTU/RESEARCH 2/4643/2020 Dated: 02.09.2021

From

The DEAN (Research)

To

The Principal
SCMS School of Engineering and Technology

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Vinoj P. G, Assistant Professor in ECE.
2. Y. K. Remya, Assistant Professor in Civil Engineering.
3. Susmi Jacob, Assistant Professor in Computer Science.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

SCMS School of Engineering and Technology

Sl.No	Name of Principal Investigator	Branch	Title of the Project	Amount sanctioned	First Installment	Second Installment	Consumables	Equipments	Travel	Contingency
1	VINOJ P G Assistant Professor	ECE	Brain Actuated Assistive Technology for the paralyzed	75,000	50,000	25,000	15,000	40,000	10,000	10,000
2	Y K Remya Assistant Professor	Civil	Geometric design consistency evaluation criteria for two lane rural combined curves	1,20,000	60,000	60,000	55,000		5000	60,000
3	Susmi Jacob Assistant Professor	CSE	ContextAuth – An implicit Authentication system for Smartphones	75,000	55,000	20,000	20,000	50,000		5,000

Research progress report (RSM CERD Research Seed Money)

Details of Project

Title of Project: Geometric design consistency evaluation criteria for two lane rural combined curves

Name of Principal Inevstigator: Y K Remya, Asst Prof., CED

Amount Sanctioned: Rs1,20,000/-

First allotted money: Rs60,000/-

Relevance of the topic

Relevance of the topic can be understood from the following facts:

- Though Kerala is a small state constituting only 1% of total area of our country, more than 3 lakh km long road network exists. So a large number of different types of curves are a common phenomenon.
- Rollover crashes of commercial vehicles at curves are mostly serious and cause severe damage and injury than other kinds of vehicle crashes.
- The relatively low roll over stability of commercial heavy vehicles promotes rollover and contributes to the number of heavy vehicle crashes.
- The lateral stability of a commercial heavy vehicle changes with the load distribution as the position of centre of gravity of loaded heavy vehicle varies.
- Lateral stability of a heavy vehicle also depends on its suspension characteristics while traversing a horizontal curve.
- Vehicle stability also depends up on geometry of the highway and on operating speed.

So this study focuses on rollover potential of heavy vehicles carrying different load distributions and to arrive at critical or unsafe load conditions. The influence of suspension characteristics of the vehicle on its lateral stability while negotiating a horizontal curve will also be studied. Moreover the study aims to determine how geometry of a curve and operating speed of vehicle influence lateral stability of the vehicle. The research also attempts to compare field study with computer simulation/mathematical modeling techniques.

Literature review

Literature are being collected and grouped into the following subgroups

- Literature giving Basic understanding of vehicle rollover phenomenon and point mass model
- Research on vehicle stability using computer simulation
- Research on vehicle stability using field study

- Literature evaluating geometric design consistency and safety

The following gaps in previous research are identified

- Current design guidelines for horizontal curves in India are based on AASHTO guidelines which were developed in consistent with studies done outside India. The adaptability of these design guidelines to Indian conditions is not investigated yet.
- Guidelines for geometric design of reverse curves and combined curves under Indian conditions are not developed yet.
- The effect of distribution of load carried by trucks on its stability at various operating speeds is not studied.

Innovation expected

- Expect new design guidelines for horizontal curves considering vehicle stability
- Safety engineers could select appropriate speed limit for heavy vehicles on different types of horizontal curves.
- Vehicle operators could identify the critical or worst load distribution condition of heavy vehicles and can avoid the situation of rollover of heavy vehicles.
- Road safety audit tool for rural highways handling freight transportation.

Methodology planned

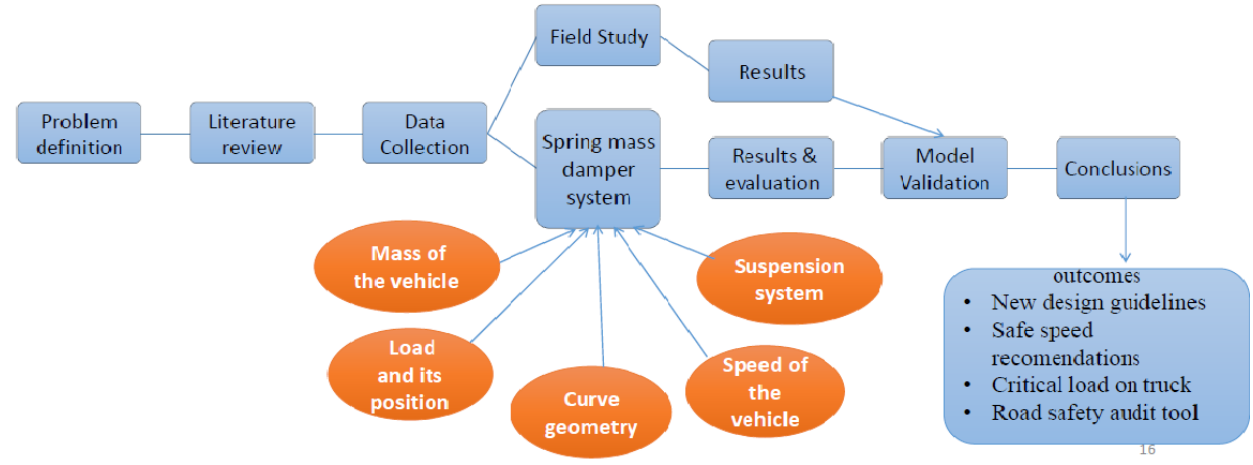


Figure 1: Flowchart showing research organization

Details of progress of research

Physical progress Crash data during 2016,2017 and 2018 collected

1. Selection of study truck(Figure 2). Characteristics of study truck shown in Table 1

2. Geometric data for simple horizontal curves and combined curves collected using total station equipment and GPS (Table 2)
3. Field survey using two axle truck equipped with Androsensor application for different loading conditions like empty condition, partial loading conditions and fully loaded condition.

Figure 2: TATA SE 1613 truck

Table 1: Characteristics of Test vehicle: TATA SE 1613 Truck and Nissan Terrano

Sl. No.	**Vehicle Characteristics**	**Truck**	**SUV**
1	Vehicle model	TATA SE 1613	Nissan Terrano
2	Gross Vehicle Weight	16200kg	1770kg
3	Suspension	Semi elliptical multi leaf spring, hydraulic double acting telescopic damper	McPherson Strut with Coil Spring Stabilizer Bar & Double Acting Shock Absorber
4	Overall height	2460mm	1671
5	Overall length	6970mm	4331mm
6	Overall Width	2434mm	1822mm
7	Track width	1890mm	1560mm
8	Wheel base	4225mm	2673mm

9	Centre of Gravity height from ground level	873mm (Empty truck) 1489mm (Truck loaded upto GVW)	835mm
10	Ground Clearance	259mm	205mm

Table 2: Summary statistics of geometry of study curves.

Sl. No	Curve Type	No. of curves	Geometric data collection Status
1	Simple Horizontal curves	91	Completed
2	Combined curves	68	Completed
3	Reverse curves	On Progress	

Collection of lateral acceleration data

The lateral behaviour of test vehicles on study curves were determined by collecting real field data through an extensive field survey. Acceleration sensor available in android phone was used for collecting lateral acceleration experienced by the vehicle. It shows in real time how much force is applied on it in the form of acceleration. The x, y and z axis show the direction of the force. x is relative to the left and right sides of the phone as you hold it looking at the screen. y is relative to the up and down sides of the phone as you hold it looking at the screen. z is relative to the front and back sides of the phone as you hold it looking at the screen. The android phones with 'Androsensor' application installed in it were mounted at six different positions inside the test vehicle as shown in figure 2, four of which were fixed above the front and rear wheel positions and the remaining two were fixed above the centre of the front and rear axles. The androsensor application gives the following data:

a) Acceleration in X, Y and Z directions
b) Geographic Location in Latitude, Longitude
c) Instantaneous speed
d) Date and Time

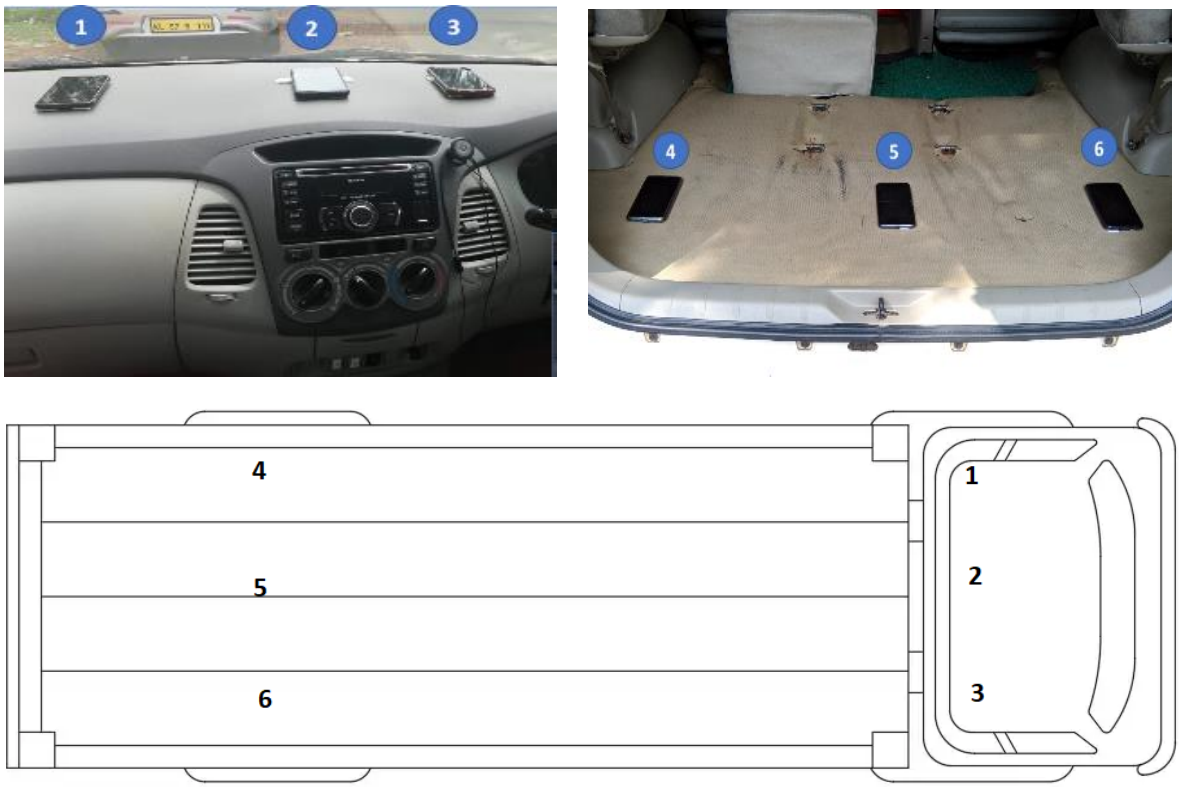


Figure 3: Sensor Positions on SUV and Truck: 1: Front left; 2: Front mid 3: Front right; 4: Rear left; 5: Rear mid; 6: Rear right

The test vehicles were operated through the study curves under natural conditions with sensor active. Test runs were conducted during off peak hours. Also, a number of trials were repeated to improve accuracy of results and to eliminate possible errors due to influence of other vehicles if any. Later, the large data set recorded by the sensor was retrieved, sorted, grouped and analyzed to obtain lateral acceleration experienced by the test vehicle along each study curve under different sensor positions and trials. Test runs were performed under dry weather conditions for SUV, empty truck and fully loaded truck.

Work to be completed

Geometric data collection of remaining curves

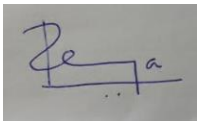
Lateral acceleration data collection using field survey for partial loading cosnitions

Data Analysis

Discussion of results and drawing conclusions

Time plan of the remaining tasks

Sl. No.	Activity	July-sep 2023	Oct-Dec 2023	Jan-March 2024	April-June 2024	July-Sep 2024	Oct-Dec 2024
1	Geometric data collection						
2	Field survey(data related to lateral stability of trucks)						
3	Data analysis and interpretation						
4	Discussion on results						
5	Drawing conclusions						
6	Generating outcomes from the model						



Signature of the Principal Investigator

SCMS COLLEGE OF ENGG AND TECH
VIDHYA NAGAR PARISSERY P.O PIN:683582
0484-2439029

Issue date:24-09-2021
Sr No: 1

यूनियन बैंक ऑफ इंडिया Union Bank of India KERALA INDIA
IFSC Code : UBIN0558885

आन्ध्रा Andhra | कार्पोरेशन Corporation

शाखा BRANCH

शाखा का पता Branch Address : 588802010007681 (SB GENERAL)

शाखा का फोन नं/ Branch Phone No.: M/S CERD RESEARCH SEED MONEY 2 4643 2020 02

खात क्र. Account No.:

In the Name of :

नाम Name i) 999,SCMS ENGG COLLEGE

ii) GENEV

iii) 20-09-2021

888,VIDHYA NAGAR
Pin : 683576 ADEN INDIA

Branch Phone No : 0484-2439029

पेशा Occupation N

पता Address

खाता खोलने की तारीख
Date of Opening A/c

नामांकन पंजीकृत / Nomination Registered : हाँ Y / नहीं N

UNION BANK OF INDIA ASSISTANT DIRECTOR

लेखाकार Accountant

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशी DEBIT	जमा की गयी राशी CREDIT	जमा कर्ता के खाते में शेष राशी BALANCE	लेखाकार आद्याक्षर INITIAL
22-03-2022	NEFT:Director of Treasuries account f47380				60000.00	60000.00Cr	
07-04-2022	588802010007681:Int.Pd:01-01-2022 to 31-03-2022				48.00	60048.00Cr	
06-07-2022	588802010007681:Int.Pd:01-04-2022 to 30-06-2022				427.00	60475.00Cr	
17-08-2022	REMYA YK		144178	40000.00		20475.00Cr	
06-10-2022	588802010007681:Int.Pd:01-07-2022 to 30-09-2022				284.00	20759.00Cr	
03-01-2023	588802010007681:Int.Pd:01-10-2022 to 31-12-2022				144.00	20903.00Cr	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT
College of Engineering Trivandrum Campus
Thiruvananthapuram. Pin 695 016

Application format for Research Seed Money

1. Title of the Research Proposal: Brain Actuated Assistive Technology for the paralyzed

2. Name & address & experience of Investigator: VINOJ P.G,ASSISTANT PROFESSOR,ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT,SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,VIDYANAGAR,PALISSERY,KARUKUTTY,ERNAKULAM-683576
MOBILE NUMBER:9446276238 EMAIL:vinojpg@scmsgroup.org
Experience: Teaching :10 years 4 months Industry: 2 years

3. Teaching experience: 10 years 4 months
Assistant Professor at SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY from 2-09-2010

4. Objectives (150 words):

- To develop a Brain-controlled assistive technology for the paralyzed
- To develop a low-cost, flexible and Light weight alternative for exoskeleton
- To control exoskeleton movements using human Intentions
- To automate the post-stroke rehabilitation and assistance using artificial Muscle Intelligence
- To develop communication aid for the paralyzed to express their feelings

5. Broad Subject area / field of classification
Brain Computer Interface (BCI), Medical Electronics/Assistive Technology

6. Project Type(s)
(Basic Research / Applied Research / Developmental / Demonstration / Others
Demonstration

7. **Abstract (400 words)**

Due to partial or full paralysis due to stroke, the majority of patients are compelled to rely upon parental figures and caregivers in residual life. With post-stroke rehabilitation, different types of assistive technologies have been proposed to offer developments to the influenced body parts of the incapacitated. In a large portion of these devices, the clients neither have control over the tasks nor can get feedback concerning the status of the exoskeleton. Brain Computer Interface (BCI) controlled assistive technology is the new paradigm, providing assistance and rehabilitation for the paralyzed. But, most of these devices are error prone and also hard to get continuous control because of the dynamic nature of the brain signals. Moreover, existing devices like exoskeletons bring additional burden on the patient and the caregivers and also results in mental fatigue and frustration. The proposed framework tackles these issues utilizing a Brain Actuated Assistive Technology for the Paralyzed (BAATP), in which the exoskeleton movements are controlled based on user intentions. The BAATP uses a flexible design which can be customized according to the

degree of disability. The BAATP system also automatically identifies the status of the paralyzed person and transmits information securely using Novel-T Symmetric Encryption Algorithm NTSA to caregivers in case of emergencies. The exoskeleton is fitted with actuators and motors which are controlled by the human intentions of the user with an Electroencephalogram (EEG) headset. The BCI interfaced micro-controller controls the high torque motors and actuators connected to the exoskeleton joints based on user intentions.To automate the rehabilitation process, Artificial Muscle Intelligence (AMI) is incorporated in the proposed system. AMI integrates user intentions with artificial muscle movements in an efficient way to improve the performance. Human thoughts captured using Electroencephalogram EEG sensors are transformed into body movements, by utilizing micro-controller and Transcutaneous Electrical Nerve Stimulation (TENS) device. EEG signals are subjected to pre-processing, feature extraction and classification, before being passed on to the affected body part. The system also provides a feature for communicating human intentions as an alert message to caregivers, in case of emergency situations. This is achieved by offline training of specific gesture and online gesture recognition algorithm. The recognized gesture is transformed into speech, thus enabling the paralyzed to express their feelings to relatives or friends. Experiments were carried out with the aid of healthy and paralyzed subjects. The AMI system can reduce mental fatigue, miss-operation, frustration, and provided continuous control. The thrust of lifting the exoskeleton is also reduced by using lightweight wireless electrodes. The proposed system will be a great communication aid for the paralyzed to express their thoughts and feelings with dear and near ones, thereby enhancing the quality of life.

8. Scientific scope of the Research proposal (400 words)

The recent survey by reeve foundation revealed the impact of paralysis on world population, affecting approximately 5.4 million people. The survey also identified stroke (33.7%) as the major cause for paralysis.Exoskeleton-assisted technologies have emerged as a reliable means for rehabilitation of the affected upper and lower limbs.Because of the dynamic and uncertain nature of brain signals, most of the BCI systems result in miss-operation, mental fatigue and it is hard to produce continuous control. The proposed system is designed to address the above gaps in research.The Brain Actuated Assistive Technology for the Paralyzed (BAATP) analyses the human thoughts and transforms it into different movements on a unique exoskeleton structure. The contributions of the research are,

1. A Brain Actuated Assistive Technology for the Paralyzed (BAATP), in which the exoskeleton movements are controlled based on user intentions.
2. An adaptive mechanism based on sensory feedback integrated with the exoskeleton to reduce the system false rate.
3. A flexible design for the exoskeleton which can be customized according to the degree of disability.
4. Automatic identification of the status of the paralyzed person and secure transmission of information to caregivers in case of emergencies
5. An Artificial Muscle Intelligence (AMI) system, in which adaptive mechanism based on recorded muscle movements is integrated with the system to enhance continuous control and facilitate rehabilitation.
6. Communication aid is incorporated in the system using gesture recognition

Methodology

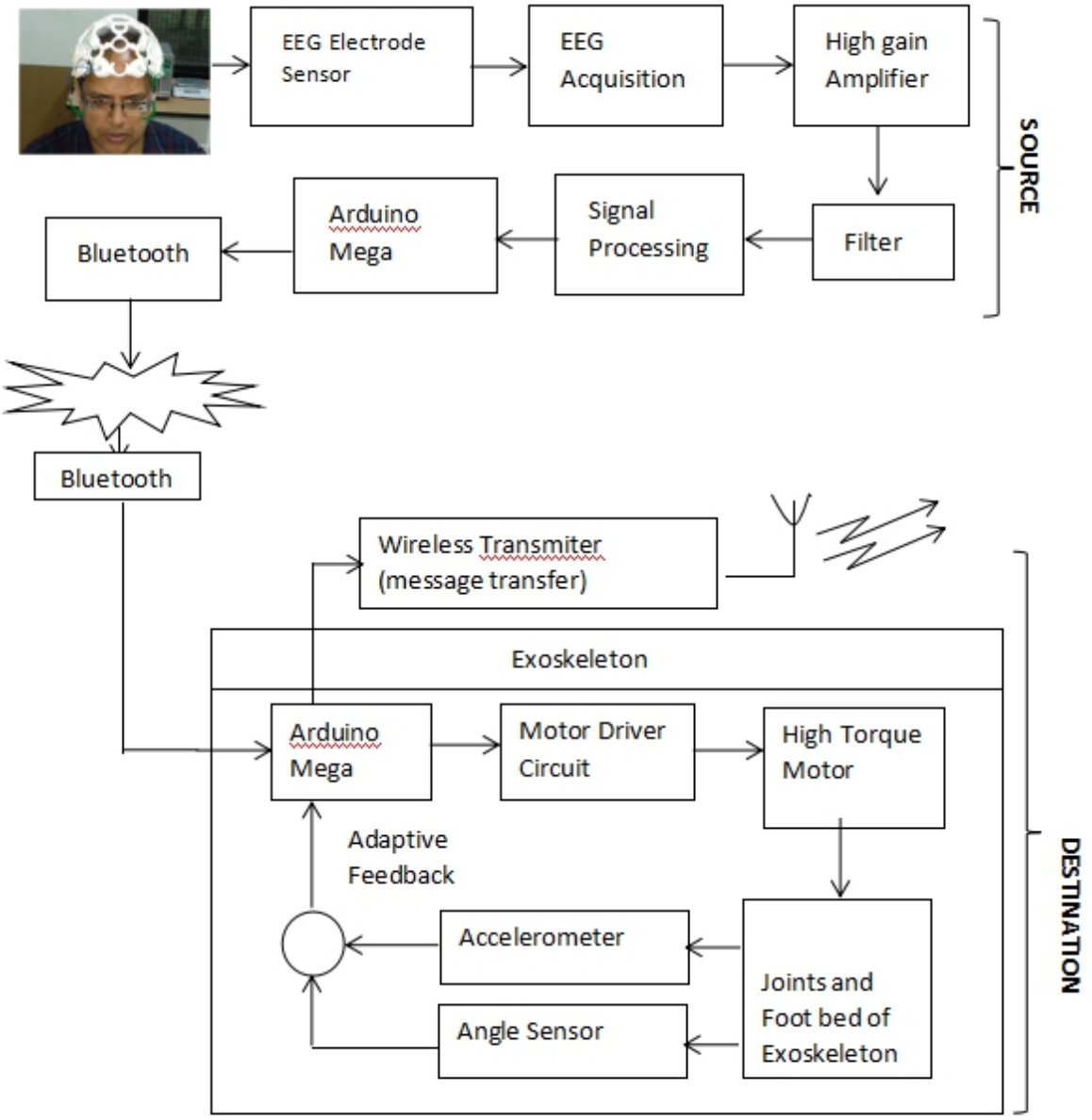


FIGURE 1. System architecture for Brain Actuated Multidimensional Exoskeleton

The architecture of the proposed system is presented in figure 1. The system design comprises an exoskeleton that replicates a lower limb, which is made using carbon fiber. The exoskeleton has total six degrees of freedom including both legs, one on each side of the pelvic bone, one on each knee and one on each ankle. Thus three degrees of freedom on each leg making it total of six degrees of freedom on the entire exoskeleton. Each joint of the lower limb is actuated using high torque motors. The movement of the exoskeleton is facilitated by controlling the degree of rotation of the motors. This exoskeleton is strapped onto the abdomen as well as foot region for improving the stability and balance of the person. Support is also provided on the back side of the ankle region. The angle sensors are placed on the joints to provide feedback regarding the status of exoskeleton. This sensor is also used to validate whether the applied force is sufficient to stabilize the

exoskeleton. The fall detection mechanism is implemented by placing an accelerometer on the back side of the lower limb to measure the tilt. If the measured sensor value crosses the threshold, a message will be given to the caregivers for emergency rescue.

The exoskeleton is controlled through human intentions. Electroencephalograph (EEG) sensors use non-invasive methods to collect the brain signals from the scalp of the person. EEG sensor has 16 electrodes incorporated in structure, where two electrodes act as the reference for measurement. The conductivity of the electrodes is improved by using gold plating. The signals collected are amplified using a high gain amplifier and a band pass filter is used for filtering high-frequency noise. In the signal processing stage, the signal undergoes further pre-processing and filtering. The suitable pattern based on the mental command is selected by using windowing technique. The signal is converted into digital data which is given as input to the micro-controller. The micro-controller does the classification of each mental command based on the feature extraction. In the training phase, users will be trained for five basic commands (sitting, standing, forward movement, right turn, left turn). The recorded patterns during the training phase will be used by the micro-controller for decision making. The recognized thought patterns will be mapped to five different commands. During the testing phase, the controller makes use of machine learning to recognize and match patterns in the input data along with the training data that is already stored in the system to make the necessary decision regarding the action to be performed. The activation command to the exoskeleton is given by the controller through the Bluetooth module. At the receiver side the micro-controller converts this command into motor action which in turn moves the desired parts of the exoskeleton. Using a three-level sensing mechanism, feedback is given to the micro-controller regarding the status of the exoskeleton. Based on this feedback the micro-controller makes the desired corrections on the activation signals. The sensory feedback gives more stability to the system, and moreover rescue messaging systems are also implemented in case of emergencies.

9. Applications / Socioeconomic importance

(The relevance, if any, to the utilization and management of the natural resources of the State)

As per the “Disability Census 2015” 2.2% of the Kerala state population is suffering from various disabilities. This project can have impact directly on approximately 8 lakhs people in Kerala and 21 million people in India. The major applications of the proposed project and its importance are listed below

1) The proposed Brain Actuated Assistive Technology for the Paralyzed (BAATP) will bypass the brain clotting and help the paralyzed person to move their paralyzed parts using Muscle stimulation

2) Our product is unique because we are incorporating rehabilitation and communication assistance in the same system itself. The Multi-dimensional system helps in Rehabilitation and intuitive communication for the paralyzed. Most of the existing assistive devices provides only rehabilitation/motion

3) Non-invasive alternative to currently existing exoskeleton designs, which is lightweight and easy to Lift

4) An adaptive mechanism based on sensory feedback integrated with the exoskeleton to reduce, accidental fall rates

5) The BAATP uses a flexible Exoskeleton design which can be customized according to the degree of disability

6) Caregiver Interventions are minimized with the use of deep learning algorithms. Most of the existing systems require dedicated caregivers

7) The proposed system provides better classification accuracy and reduced false rates.
8) Deep learning algorithm helps to reduce mental fatigue and provides continuous Control
9) The major advantage of this innovation is that it can be applied to any existing assistive technology like MMIP (muscle to muscle interface for the paralyzed), Exo-skeleton etc. with minor modifications
10) This system can be easily passed down to any living beings which is having communication disabilities
11) The proposed system will be a great communication aid for paralyzed to express their thoughts and feelings with dear and near ones, thereby enhancing the quality of life

10. Scientific background of the project

a) Importance of the problem

1. The solution to the proposed problem can have direct/indirect impact on 21 Million peoples in India and 100 million people world-wide as per the Reeve foundation survey
2. Problem is aimed at enhancing the quality of life of the paralyzed
3. The Multi-dimensional system helps in Rehabilitation and intuitive communication for the paralyzed. Most of the existing assistive devices provides only rehabilitation/motion
4. Project can have impact on the existing exoskeleton designs, making it lightweight and easy to carry
5. Caregiver Interventions are minimized with the use of deep learning algorithms. Most of the existing systems require dedicated caregivers
6. Enhance user experience by reducing mental fatigue and provides continuous control
7. The proposed solution to the problem will be a great communication aid for paralyzed to express their thoughts and feelings with dear and near ones

b) Related work already performed or in progress at your organization or in the state.

1) Muscle Machine Interface for the paralyzed (MMIP) at SCMS School of engineering and technology, Karukutty
2) Brain Controlled Robot at SCMS School of Engineering and Technology, Karukutty

c) Related work already performed or in progress at other places in India or abroad.

1) BCI based Control, CDAC, Noida
2) Brain Control devices,CBR,IISc Bangalore
3) Re-walk Robotics,USA is an innovative medical device company that designs, develops, and commercializes robotic exoskeletons,
4) Home automation and smart wheel chair based on Electroencephalography (EEG) signals produced in brain",BITS,Pilani

11. Details of any preliminary work done by the investigator

- Literature survey and market study of existing Assistive devices, Identified the gaps in existing designs
- Tie-up with Sunrise hospital,Kochi to interact with paralyzed persons and medical practitioners
- Tie-up with NeuroSky and Backyard Brain, USA for expertise in EEG sensor design
- Real-time EEG data Acquisition and Analysis using Emotive EPOC mobile EEG headset
- Customized EEG sensor designed with 16 Electrodes
- Exoskeleton designed for the actuation of the affected lower Limb
- Implemented and Tested Brain-Controlled lower limb exoskeleton on the paralyzed patients and healthy subjects
- Developed an alternative method for Muscle stimulation without using exoskeleton
- Brain signal Analysis using realistic head models

Figures of Implementation/Simulations

Figure 1. Emotive EPOC mobile EEG headset

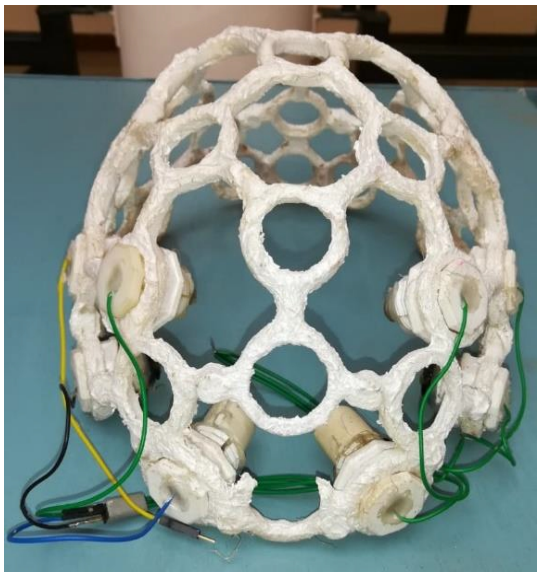


Figure 2. Designed EEG Sensor with electrodes

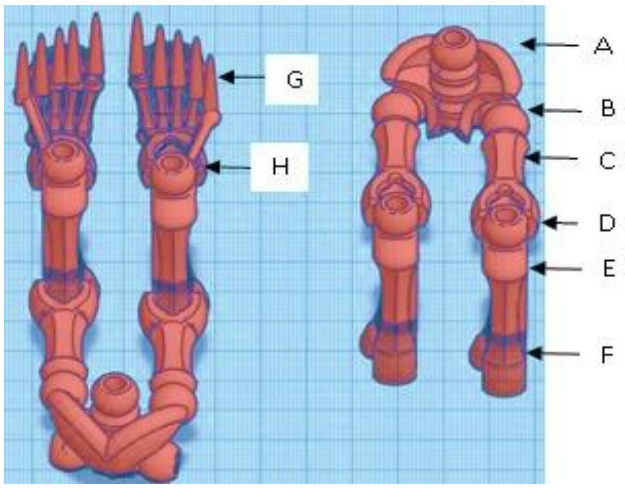


Figure 3: Complete Lower body part exoskeleton (3d Model designed)

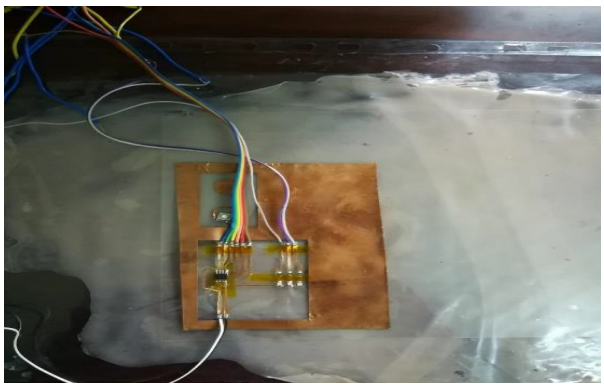


FIGURE 4. Artificial Skin along with processor and sensor circuit

FIGURE 5.Controlling the outer structure of exoskeleton using EEG headset

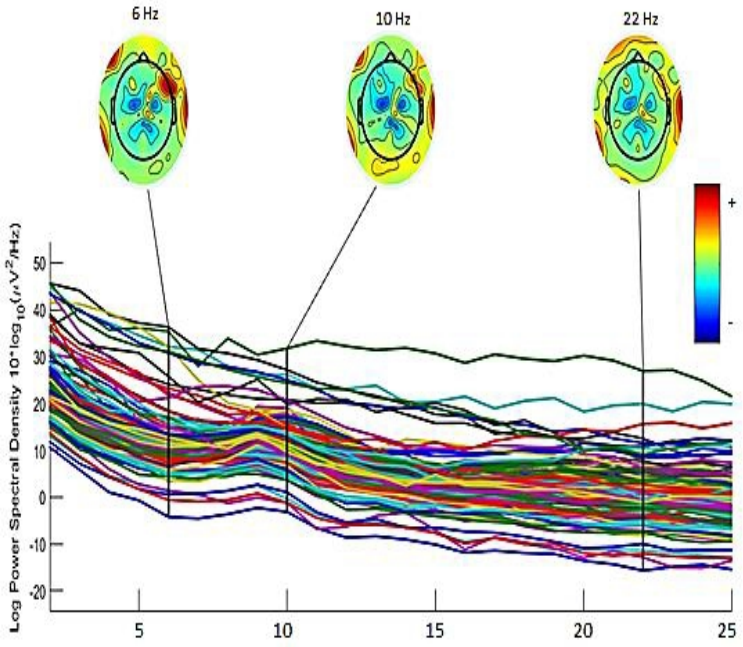


FIGURE 6. Brain pattern variations at different frequencies

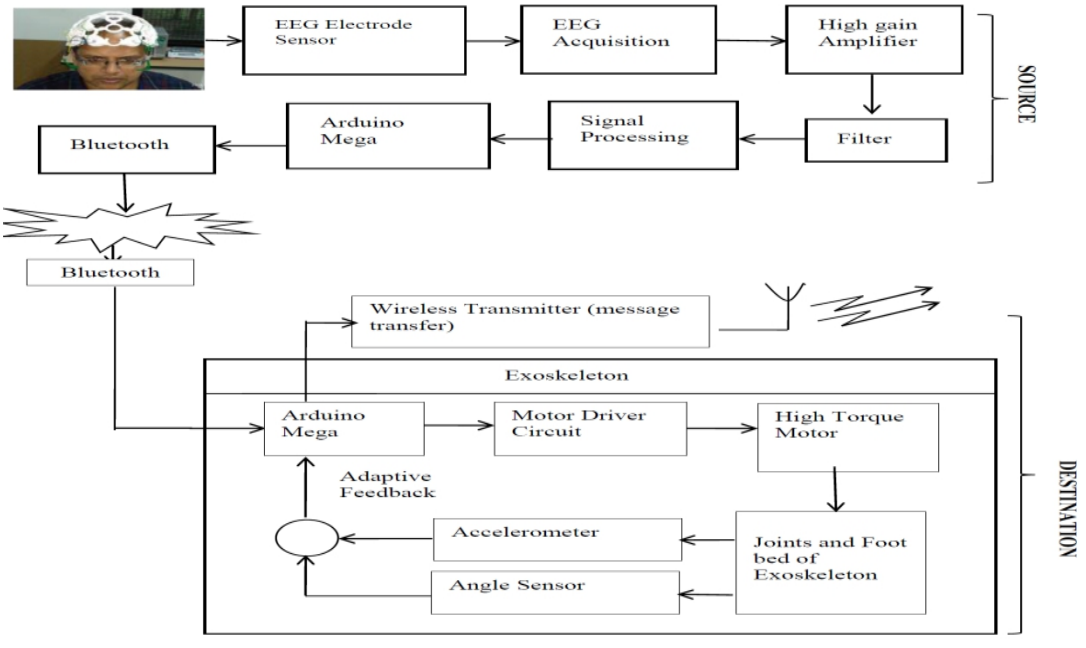


FIGURE 1. System architecture of Brain Actuated Multidimensional Exoskeleton

12. Detailed year wise work plan (Indicate methods / Techniques to be used)

Brain Actuated Assistive Technology for the paralysed(BAATP) Project Plan for 24 months

Activity	Plan Start (months)	Plan Duration (months)	Period in Months																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Design of EEG sensor, Muscle stimulation Unit,Signal Contition Unit,Brain signal analysis using Realistic Head models	1	6																								
Mechanical Design of Exoskeleton,Microtroller Programming for Algorithm Implementation, Interfacing of EEG sensor and Exoskelton with Microcontroller,System Integration and Testing	7	6																								
Real time data Collection and Analyses,Intergration of Artificial Muscle Intelligence,Deep-learning Model development, Online Testing using the Model	13	7																								
Usability Testing of the integrated prototype device on paralyzed patients,Incoperating Feedback from patients and Medical Practitioners,Final Assembly and Testing	20	5																								

13. Particulars of equipment required

1) 3D printers
2) CNC Machine
3) Soldering and Drilling machine
4) Electronics work bench
5) Laser Cutter
6) PCB Milling Machine,CRO,Digital Oscilloscope

14. Particulars of any other facilities required

NIL

15. **Particulars of the facilities that will be provided by the institution where this project will be implemented**

1)3D printers
2) CNC Machine
3) Soldering and drilling machine

16. Whether the project was submitted to any other organization for financial support

NO

17. Budget Details: Estimated expenditure

Sl No	Items	Amount (Rs)
1	Consumables **(Do not exceed 20% of the total amount)**	40,000/-
2	Equipment (For Private self-financing Colleges, 50% of the actual Equipment cost subject to the maximum of sanctioned amount shall be borne by the college)	1,40,000/-
3	Travel **(Do not exceed 10% of the total amount)**	10,000/-
4	Contingency **(Do not exceed 10% of the total amount)**	10,000/-
	Total	2,00000/- (Two Lakhs Only)

Budget Justification:

1. Consumables : Rs 40,000/-(Forty Thousand)

- EEG/EMG, Pressure,Accelerometer,gyroscope sensors,cables,Controller Boards,shields,Actuators,Motors,Batteries and Other electronic Components

2. **Equipment :** Rs 1,40,000/-(One lakh Forty Thousand)

Rental for Equipment Like 3D printers, Laser Cutters, NC Machines, Purchase of electronic Equipment like Multi-meter, soldering Iron, material for 3D printing, drill bits, Acrylic and plywood sheets for laser Cutter

3. **Travel**: Rs 10,000/-(Ten Thousand)

- Travel Budget will be utilized for meeting doctors, patients and subject experts

4. Contingency: Rs 10,000/-(Ten Thousand)

- Contingency Fund is utilized for patent filing, medical committee approval, to cover unforeseen risks during patient usability testing.

18. **The sources of funding the project including funds from other agencies from which financial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency**

NIL

19. Quantum and nature of assistance expected from the CERD KTU

Financial and Technical support to implement the project

20. Name and address of the authority of Institution authorized to receive the grant

Dr.PRAVEENSAL C J,
PRINCIPAL, SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,
VIDYANAGAR, PALISSERY, KARUKUTTY, ERNAKULAM-683576

21. **Whether grant under this scheme had been availed earlier by the investigator:** NO (If so, provide details)

22. **Details of projects already undertaken by the Principal Investigator with any other funding agency**

1. KSCSTE funded student project “Mute Horn”-A device to reduce sound pollution with a funding amount of Rs 10000/- on January 2020 as Principal Investigator
2. KSCSTE funded student project “Wearable device for detection And Prevention of Heart Failure” with a funding amount of Rs 15000/- on January 2017 as Principal Investigator
3. Manorama Yuva Mastermind Funded student Project “Wearable device for detection And Prevention of Heart Failure”with a funding amount of Rs 10000/- on April 2017 as Mentor
4. KSCSTE funded student project “Bionic haptic Arm” with a funding amount of Rs 15000/- on January 2016 as Co-Investigator
5. KSCSTE funded student project “Eco-friendly Traffic Junction” with a funding amount of Rs10000/- on January 2020 as Co- Investigator

Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance, if granted, will be utilised for the purpose for which it is granted within the time prescribed by CERD KTU. I also undertake to abide by the rules and other conditions prescribed by the grantee.

VINOJ P.G

Name and Signature
of the Investigator

Name and Signature
of the Prof-in-charge
CERD Satellite Centre

Name and Signature of
Head of the Institution

DR. PRAVEENSAL C.J.
PRINCIPAL
SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

(Office seal)

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 582

Place: Karukutty

Date: 14/1/2021

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT
College of Engineering Trivandrum Campus
Thiruvananthapuram.
Pin 695 016

RESEARCH SEED MONEY

Name & address of the Principal Investigator:
VINOJ P.G, ASSISTANT PROFESSOR,
ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT, SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY, VIDYANAGAR, PALISSERY, KARUKUTTY, ERNAKULAM-683576
MOBILE NUMBER: 9446276238 EMAIL:vinojpg@scmsgroup.org

Title of the Research Proposal: Brain Actuated Assistive Technology for the paralyzed

Broad Subject area/field of classification: Brain Computer Interface (BCI), Medical Electronics/Assistive Technology

Terms and Conditions

1. The scheme is constituted for the purpose of providing assistance in the form of grants to initiate research work in Engineering and Technology with particular relevance to the State of Kerala in the economic and industrial development.

2. Grant will be released to the Principal Investigator of the project through the Head of the institution.

3. The maximum duration of the project will be three years from the release of grant.

4. On completion of the project, one copy of the final project report on the work done should be sent to the CERD KTU along with the utilization certificate (UC), certified bills, bill wise statement and statement of expenditure (SE). Copy of the relevant pages of the Bank pass book should also be attached along with the documents for settlement.

5. The institute shall maintain separate audited accounts for the project.

6. The institute shall not entrust the implementation of the work for which the grant is being sanctioned to another institution nor shall divert the grant receipts to other institute as assistance.

7. The CERD KTU reserves the right to terminate the project at any stage if it is convinced that the grant has not been properly utilized or appropriate progress is not being made. In addition, the CERD KTU may designate a Scientist/Specialist or an Expert Panel to review the work done.

8. If the PI to whom the project has been sanctioned leaves the Institution, the Head of Institution/PI shall inform the same to the CERD KTU and in consultation with the CERD KTU, evolve steps to ensure successful completion of the project, before relieving the PI.

9. Investigators must acknowledge the CERD KTU in reports and technical/scientific papers published based on the research work done under the project. Investigators are requested to publish some of the research papers emerging out of the project work in leading Journals.

10. If the results of research are to be legally protected by way of patent/copy rights etc. the results should not be published without action being taken to secure legal protection for the research results.

11. The knowledge generated from the project will be the property of the CERD KTU and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD KTU.

12. For Private self-financing Colleges, 50% of the actual Equipment cost subjected to the maximum of sanctioned amount will be reimbursed by KTU if and only if the proof of remittance of other 50% is produced by the college.

13. Equipment details must be entered in a separate stock register for the RSM project signed by the investigator, lab in charge and Principal. A separate stock entry certificate has to be furnished by the Principal Investigator with the authentication of Head of Institution.

14. The grant amount should be deposited in a separate bank account in the name of the Principal investigator and Head of Institution jointly.

15. The interest accrued shall also be accounted in the project.

16. If the project is not completed within the time limit, the grant amount should be reimbursed along with interest accrued.

17. The CERD KTU may enforce additional guidelines for the operation of research project from time to time and the Institution/Investigators are required to observe such directions in the conduct of the research work.

We agree to the terms and conditions stated above.

VINOJ P.G

Name & Signature of
Principal Investigator

Name & Signature of
Prof-in-charge
CERD Satellite Centre

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 582

(Office Seal)

Name & Signature of
Head of Institution

DR. PRAVEENSAL C.J.
PRINCIPAL
SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

Phone No 0484-2439029

Customer Care No:1800222244

900470299 M/S CERD RESEARCH SEED MONEY 2 4643 2020 SB

बचत बैंक खाता
पास बुक

SAVINGS BANK
PASS BOOK

नामांकन सुविधा उपलब्ध
Nomination facility available

नाम
Name

खाता क्र. 588802010007682 (SB GENERAL)
A/c No.

Cust Id : 900470299

MICR Code :

IFSC Code : UBIN0558885

About Dormant Accounts :- "Savings Bank Accounts, which are inoperative for a continuous period of 12 months will be classified as Dormant. Operations will not be allowed in Dormant Account. Customers are requested to contact the Branch Manager for reactivating the account and are requested not to issue any cheques on dormant accounts before they are reactivated".

About alterations / overwritings on cheque :- "No Changes / corrections should be carried out on the cheques. For any change in the payee's name, amount (other than date for validation purposes) etc., fresh cheque forms should be used."

www.unionbankonline.co.in/

यूनियन बैंक ऑफ इंडिया
Union Bank of India
भारत सरकार का उपक्रम
A Government of India Undertaking

आन्ध्रा Andhra
कार्पोरेशन Corporation

यूनियन बैंक ऑफ इंडिया Union Bank of India KERALA INDIA

Issue date:24-09-2021
Sr No: 1

SCMS COLLEGE OF ENGG AND [illegible]
VIDHYA NAGAR, PARAVOOR-683582
0484-2439029

IFSC Code : UBIN0558885

शाखा BRANCH

शाखा का पता Branch Address : 588802010007682

शाखा का फोन नं/ Branch Phone No.: (CB GENERAL)

खात क्र. Account No.: M/S CERD RESEARCH SEED MONEY 2 4643 2020 01

In the Name of :

नाम Name i) 9999,SCMS ENGG COLLEGE 8888,VIDHYA NAGAR

ii) GENEV Pin : 683576 ADEN INDIA

iii) 20-09-2021

पेशा Occupation Branch Phone No : 0484-2439029

पता Address N

खाता खोलने की तारीख
Date of Opening A/c

नामांकन पंजीकृत / Nomination Registered : हाँ Y / नहीं N

लेखाकार Accountant

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशी DEBIT	जमा की गयी राशी CREDIT	जमा कर्ता के खाते में शेष राशी BALANCE	लिपिकार आद्याक्षर INITIAL
B/F						0.00	
22-03-2022	NEFT:Director of Treasuries account f47380				50000.00	50000.00Cr	
07-04-2022	SBBI020100007682:Int.Pd:01-01-2022 to 31-03-2022				40.00	50040.00Cr	

Annexure II

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Centre for Engineering Research and Development
Request for releasing RSM grant

Title of Project: ContextAuth : An implicit Authentication system for smartphones.

Date of sanction: 2.09.2021

Amount sanctioned: 75,000/-

Account No and bank details: 588802010007680, UNION BANK OF INDIA, PALISER
IFSC code: UBIN0558885
A/c name: CERD RESEARCH SEED MONEY 246432020 0

Terms & Conditions for Research Seed Money Scheme

1. The amount sanctioned for the project shall be deposited in a separate joint A/c of Principal Investigator and Head of the institution where the Principal Investigator works. (Name of A/c: CERD Research Seed Money - File No.)

2. The maximum duration of the project will be three years from the date of start of the project

3. The amount has to be utilized as per budget provision under each head. It is the discretion of the University to settle amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

4. The purchase of equipments shall be in accordance with the store purchase rules. All equipment purchased will be the property of CERD and the stock entry of the items purchased shall be maintained in the College signed by the Investigator, Lab in charge and Principal. Purchase of computers/peripherals is not allowed unless specifically mentioned in the sanction order.

5. For Private self financing Colleges, 50% of the actual Equipment cost subjected to the maximum of sanctioned amount will be reimbursed by KTU if and only if the proof of remittance of other 50% is produced by the college.

6. The stock entries of consumables purchased shall also be done in the consumables stock register of College. Purchase of stationery shall be for project purpose only.

7. Books and literature purchased should be taken into the Stock Register of Central Library or Department library and then distributed to the investigators.

memorandum of understanding to the extent that such delay or failure is caused by or arises from acts or circumstance or events beyond the reasonable control of that party, including not limited to acts of god, acts or regulations of any governmental authority, war or national emergency, accident, fire, riot, strikes, lock-outs, industrial disputes, natural catastrophes or epidemics.

Each Party shall bear its own losses arising from such force majeure event(s), if any.

6. INTELLECTUAL PROPERTY

All prior information, design and data existing with either party before the signing of this MoU (pre-existing IP) shall be the sole property of the concerned party. All Intellectual Property including design information, designs, source codes and data generated through the collaboration under this MOU shall be as mutually agreed in writing and also as per the guide line of the funding agency, if such an agency is involved. Any IPR arising specifically out of this collaboration will be owned by both parties, except when mutually agreed in writing otherwise.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of understanding to be executed in duplicate, through their representatives at Thiruvananthapuram in the day and year first above written:

Now the memorandum of understanding witnesses as follows.

Principal

SCMS School of Engineering and Technology
APJ Abdul Kalam Technological University

DR. PRAVEENSAL C.J.
PRINCIPAL
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY

Dean (Research)

APJ Abdul Kalam Technological University
Thiruvananthapuram 695016

Witness: 1
Signature: 13.10.2021
Name: DR. ANITHA G PILLAI

Witness: 1
Signature:
Name:

Witness: 2
Signature: 13/10/2021
Name: DR. MINI TOM

Witness: 2
Signature:
Name:

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 576

Name: DR. PRAVEENSAL C J

Office Address: PRINCIPAL
SCMS School of Engineering
& Technology.
683576.

Seal

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 576

Annexure II

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Centre for Engineering Research and Development

Request for releasing RSM grant

Title of Project: ContextAuth : An implicit Authentication system for smartphones.

Date of sanction: 2.09.2021

Amount sanctioned: 75,000/-

Account No and bank details: 588802010007680, UNION BANK OF INDIA, PALISER

IFSC code: UBIN0558885

A/c name: CERD RESEARCH SEED MONEY 246432020 0

Terms & Conditions for Research Seed Money Scheme

1. The amount sanctioned for the project shall be deposited in a separate joint A/c of Principal Investigator and Head of the institution where the Principal Investigator works. (Name of A/c: CERD Research Seed Money - File No.)

2. The maximum duration of the project will be three years from the date of start of the project

3. The amount has to be utilized as per budget provision under each head. It is the discretion of the University to settle amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

4. The purchase of equipments shall be in accordance with the store purchase rules. All equipment purchased will be the property of CERD and the stock entry of the items purchased shall be maintained in the College signed by the Investigator, Lab in charge and Principal. Purchase of computers/peripherals is not allowed unless specifically mentioned in the sanction order.

5. For Private self financing Colleges, 50% of the actual Equipment cost subjected to the maximum of sanctioned amount will be reimbursed by KTU if and only if the proof of remittance of other 50% is produced by the college.

6. The stock entries of consumables purchased shall also be done in the consumables stock register of College. Purchase of stationery shall be for project purpose only.

7. Books and literature purchased should be taken into the Stock Register of Central Library or Department library and then distributed to the investigators.

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
CET campus, Thiruvananthapuram - 695 016
Ph: 0471 2598122; Fax: 2598522 www.ktu.edu.in Email: university@ktu.edu.in

Dated: 02.09.2021

No. KTU/RESEARCH 2/4643/2020

From
The DEAN (Research)

To
The Principal
SCMS School of Engineering and Technology

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To
1. Vinoj P. G, Assistant Professor in ECE.
2. Y. K. Remya, Assistant Professor in Civil Engineering.
3. Susmi Jacob, Assistant Professor in Computer Science.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

Research Seed Money - CERD

Ms. Susmi Jacob, Assistant Professor, Department of CSE, SSET, has been awarded CERD RSM (Research Seed Money) fund of 75,000/- rupees for the project titled "ContextAuth – An implicit Authentication system for Smartphones".

Abstract :

A context-aware implicit and continuous multimodal authentication system is proposed to identify and validate a user. Different modalities include touch gestures and typing behaviour that leverages different built-in smartphone sensors while typing a password, head movements while user making calls or interacting with smartphone through voice and, finally different voice modalities which utilizes unique audio features of the user.

Progress of work :

The fund was approved on July 2021. And first instalment of rupees 55,000/- was released on March 2022. Withdrawal of rupees 45,000/- was requested and sanctioned in June 2022. Account statement till February 2023 is attached herewith.

Purchase details

The equipment purchased for the ongoing work include:

1. Adafruit Playground Bluefruit – Bluetooth Low Energy
2. MPU-6050 3-axis Accelerometer and Gyro Sensor
   Total Purchase cost – 3188/- (from ROBU.IN)

3. Kodenshi IR sensor – Infrared sensor
4. NordicSemi Embedded AI Dev board
   Total purchase cost – 3700/-

Head of Department

Dr Varun G Menon

Principal Investigator

24/2/23

Susmi Jacob

PRESIDENT
SCMS COLLEGE OF ENGG AND TECH
VIDYA NAGAR PERUMBAVOOR KERALA 683542
0484-2439029

Issue Date:24-09-2021
Sr No: 1

यूनियन बैंक ऑफ इंडिया Union Bank of India KERALA INDIA
IFSC Code : UBIN0558885

शाखा BRANCH 588802010007680
शाखा का पता Branch Address : (SB GENERAL)
शाखा का फोन नं/ Branch Phone No.: C/S CERD RESEARCH SEED MONEY 2 4643 2020 03
खात क्र. Account No.:
In the Name of :
नाम Name i) 999,SCMS ENGG COLLEGE 888,VIDHYA NAGAR
ii) GENEV Pin : 683576 KERALA INDIA
iii) 20-09-2021 Branch Phone No : 0484-2439029
N
पेशा Occupation
पता Address

खाता खोलने की तारीख
Date of Opening A/c

लेखाकार Accountant

नामांकन पंजीकृत / Nomination Registered : हाँ Y / नहीं N

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशी DEBIT	जमा की गयी राशी CREDIT	जमा कर्ता के खाते में शेष राशी BALANCE	लेखाकार
03-03-2022	NEFT:Director of Treasuries account f47380				55000.00	55000.00Cr	
07-04-2022	58880201000768O:Int.Pd:01-01-2022 to 31-03-2022				127.00	55127.00Cr	
13-06-2022	SUSMI JACOB		144195	45000.00		10127.00Cr	
06-07-2022	58880201000768O:Int.Pd:01-04-2022 to 30-06-2022				331.00	10458.00Cr	
06-10-2022	58880201000768O:Int.Pd:01-07-2022 to 30-09-2022				72.00	10530.00Cr	
03-01-2023	58880201000768O:Int.Pd:01-10-2022 to 31-12-2022				73.00	10603.00Cr	

भारतीय सूचना प्रौद्योगिकी संस्थान कोटा
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA
2nd Floor, Prabha Bhawan, MNIT Campus, JLN Marg, Jaipur -302017
Ph: 0141-2715071, E-Mail: office@iiitkota.ac.in

No: IIITK/2021-22/R&D/4073 Date: February 18, 2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Deepasree Varma** is Co-Principal Investigator in the project entitled "Cross-lingual knowledge transfer for social media analysis in less-resourced languages during COVID-19", which is approved by the Department of Science & Technology (International Bilateral Co-operation Division) under the scheme India-Slovenia Bilateral Scientific and Technological Cooperation, Government of India. The file number is DST/ICD/Slovenia/P-15/2021 (TPN: 55580). The cost of the project is Rs.16,64,640/- for a duration of three years.

Please feel free to contact me for any further information at basant.cse@iiitkota.ac.in

Dr. Basant Agarwal,
Principal Investigator,
Assistant Professor, IIIT Kota

RajCOMP Info Services Ltd.
(A Government of Rajasthan undertaking)
email: info.risl@rajasthan.gov.in
website: www.risl.rajasthan.gov.in
CIN : U72200RJ2010SGC033185

F1.9(139)/RISL/MISC/2015/8802

Date: 31/03/2

The Indian Institute of Information Technology,
2nd Floor, Prabha Bhawan, MNIT Campus,
JLN Marg, Jaipur - 302017

Sub: Contribution for research and development of project "Social media analysis using explainable artificial intelligence (AI) based techniques for less-resourced languages" under Corporate Social Responsibility (CSR) head of RISL.

We wish to inform you that a research project titled "Social media analysis using explainable artificial intelligence (AI) based techniques for less-resourced languages" (the "Project"), has been approved for contribution of Rs. 7,55,000/- by RISL (A Government of Rajasthan Undertaking) under its CSR head for the financial year 2021-22 to Indian Institute of Information Technology, Kota ('IIIT Kota') having following project investigators:

S. No.	Name of Investigators	Designation	Role
1.	Dr.Basant Agarwal	Assistant Professor, Department of Computer Science and Engineering, Indian Institute of Information Technology Kota (IIIT Kota), MNIT Campus, Jaipur -302017, India	Principal Investigator
2.	Dr.Vinod P.	Professor, Department of Computer Applications, Cochin University of Science & Technology, Cochin, Kerala, India, University Road, South Kalamassery, Kalamassery, Kochi, Kerala 682022	Co-Principal Investigator-I
3.	Deepasree Varma	Assistant Professor, Department of Computer Science, SCMS School of Engineering and Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576, Kerala	Co-Principal Investigator-II

The fund has been transferred to the account of IIIT Kota.

RajCOMP Info Services Ltd
C...ck 1st Floor, Yojna Bha
Tilak Marg, C-Sheme
Jaipur-302 005

RISL

RajCOMP Info Services Ltd.
(A Government of Rajasthan undertaking)

email: info.risl@rajasthan.gov.in
website: www.risl.rajasthan.gov.in
CIN : U72200RJ2010SGC033185

The sanction is subject to the Terms and Conditions as mentioned below:

1. IIIT Kota should acknowledge the contribution under CSR received from the RISL in all the outcomes of the project.
2. The contribution shall be spent within the duration of the project.
3. The Intellectual property rights associated with the project shall vest with IIIT Kota and RISL.
4. The Project Investigators will be in-charge to take the decisions regarding all the matters related to the project as per IIIT Kota Norms.
5. IIIT Kota shall submit the Utilisation Certificates along with status reports from time to time till completion of the Project Implementation.

tah 31/03

(Sandesh Nayak)
Managing Director

RajCOMP Info Services Ltd.
Block Ist Floor, Yojna Bha
Tilak Marg, C-Sheme
Jaipur-302 005

File Ref.No.KTU/RESEARCH5/467/2022

APJ Abdul Kalam Technological University
Thiruvananthapuram

Abstract

APJAKTU - Financial Assistance to Student Projects 2022 - Administrative Sanction accorded - Orders issued.

RESEARCH SECTION

U.O.No. 964/2022/KTU Thiruvananthapuram, Dated: 27.04.2022

Read:-1. Minutes of the 1st meeting of Engineering Research Council dated 27.01.2010.

2. Minutes of 2nd meeting of Executive Committee dated 21.10.2010.
3. Meeting of the 2nd Research Council dated 29.02.2017.
4. Proposals of Student Projects for Financial Assistance.
5. Screening Committee meeting held on March/April 2022 for evaluation of project proposals.

ORDER

Vide paper read 1st above, the Engineering Research Council had approved the scheme for Financial Assistance to Student Projects for the Government Engineering Colleges. Vide paper read 2nd above, it was decided to extend the financial assistance to the student projects to the students of the Government aided and Government Controlled Engineering Colleges.

It was decided to extend the financial assistance to Student Projects for all engineering colleges affiliated to the University with NBA accreditation as per paper read 3rd above. It was also decided that the financial assistance will be provided as reimbursement of expenditure occurred for the sanctioned project.

The Screening Committee meetings held in March/April 2022 evaluated the project proposals forwarded from Engineering Colleges affiliated to the University and recommended financial assistance to selected proposals as per the List appended.

Administrative sanction is therefore accorded for financial assistance to student project as detailed in the list attached below. The project shall be completed within a period of 1 year and the project shall be completed with the students who presented the project before the Screening Committee.

The expenditure should be incurred as per the terms and conditions as per Annexure II attached. The amount will be reimbursed to the Principal of the concerned Colleges only after the successful completion of the project and on the production of certified bills & vouchers along with the audited utilization certificate, statement of expenditure and project completion report.

The expenditure shall be met from the Head of Account “S 3022-Innovative Student Project”.

Orders are issued accordingly.

Sd/-

Dr. Shalij P.R *
DEAN (Research)

Copy to:-

1. Principals of Engineering Colleges.
2. Principal Investigators.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

69	Dr. Rajesh Baby Associate Professor	Bilbin Mathew Paul Vargheson Alan Philip Rajan	Development of an automatic height adjusting pillow to relieve chronic neck pain (cervicalgia).	St. Joseph's College of Engineering and Technology Palai.	10,000	25,000	5000	5000		45,000	MECH
70	Ivin Jose Assistant Professor	Thimothy Benny Akhil Krishnan Genesis J Cheruvallil Benchamin Tomy	Tool design and fabrication of hybrid electro discharge grinding setup for microchannels	St. Joseph's College of Engineering and Technology Palai.	10,000	25,000	5000	10,000		50,000	MECH
71	Dr. Madhukumar S Professor	Prince Jose Vijay Varghese Amal Varghese Jubin Thomas	Borewell rescue robot	St. Joseph's College of Engineering & Technology Palai	5000	15,000		1500		21,500	ECE
72	Anto Manuel Assistant Professor	Adithya Sunil, Ben Alphin Binny, Jobin Benny Roshan Rajeev	An Intelligent Device To Predict Cloud Burst	St. Joseph's College of Engineering and Technology Palai.	5000	15,000		1500		21,500	ECE
73	Dr. Praseetha V M Associate Professor	Anjana V M Tinu Sam Rona Mariam Shaji Tressa Mary Joseph	Gesture based device controlling system	St. Joseph's College of Engineering and Technology Palai.	3000	11,500		1800		16,300	CSE
74	Dr.Georgina Binoy Joseph Associate Professor	Akshara Sajeevan Ann Mary Abraham Aswathy Meria Peter Honeymol M Jose	SMART MIRROR	Toc H Institute of Science and Technology	2000	10,000		1500		13,500	ECE
75	Girish.P Assistant Professor	Anagha Biju Betty George KP Manjulika Sneha Baby.KX	ACCI-LERT SYSTEM	Toc H Institute of Science and Technology	2000	8000		1500		11,500	ECE
76	Dr.Rosebell Paul Asst. Professor	Neeraj M Neeraj Sagar Vaibhav Nair Yadukrishnan PS	An AI Based Swarm Wheel fot system to detect Cracks in Railway Tracks.	SCMS School of Engineering and Technology, Ernakulum, KarukutY	8260	36,000		4,000		48,260	CSE
77	Harish T M Assistant Professor	Nandu Krishnan A U Nasmal Navas Sreekanth K.A	Development and fabrication of Al 7075 composite reinforced with industrial waste and clay	Federal Institute of Science ancl Technology, Ernakulam	10,000	10,000	5000	20,000		45,000	MECH
78	Manu Mohan C M Assistant Professor	Joheon C P Joseph Paul Linto Thomas Rajeev K R	Sign language to speech converter using machine design	Federal Institute of Science ancl Technology, Ernakulam	3500	10,000	500	2500		16,500	ECE
79	Sreevidya P Assistant Professor	Gokul Rejitkumar Godson Thomas	Integrated communication system for deaf and mute	Federal Institute of Science ancl Technology, Ernakulam	3000	10,000		1000		14,000	ECE
80	S Sundararajan Assistant Professor	Bilal Ibrahim P A Rajeena R Sony Shajan	Fruits adulteration detection system	Federal Institute of Science ancl Technology, Ernakulam	1500	5000		1000		7500	ECE
81	Panjami K Assistant Professor	Aleena Garvasis Apsara S Baiju Gayathri S Kumar Gokul S	Study on Effeetiveness of Mobile sensors in deteeting sutrsurface cavities- A step towards earlv detection of cavities at Kerala	Federal Institute of Science ancl Technology, Ernakulam	10,000		35,000	5000		50,000	CIVIL

A SWARM BASED AI AIDED WHEEL BOT SYSTEM TO DETECT CRACKS IN RAILWAY TRACKS

INTRODUCTION

Indian Railway is one of the largest transportation networks in the world. It has a daily passenger count of 24 million passengers.For such a vast network the possibilities of lapses in safety is alarmingly high.

One of the major causes of hazard would be disruption in locomotive movement. Cracks in railway tracks have been identified as one of the major causes of railway accidents.Currently there isn't a fail proof system to detect and fix cracks on railway tracks. The system still follows the primitive methods of manual checking and solving.The project focuses on providing a real-time solution to the identified cracks on railway tracks. Once identifying a crack as a threat the agent aims at alerting the nearby agents as well as a base station by an active communication channel that updates the status in real-time. The projects implements a wheel-bot (UGV) which is able to differentiate between cracks and intentional gaps(thermal expansion). The Robots Dynamically communicate with other agents (Swarm Robotics approach) and the main workstation to relay information regarding the problems

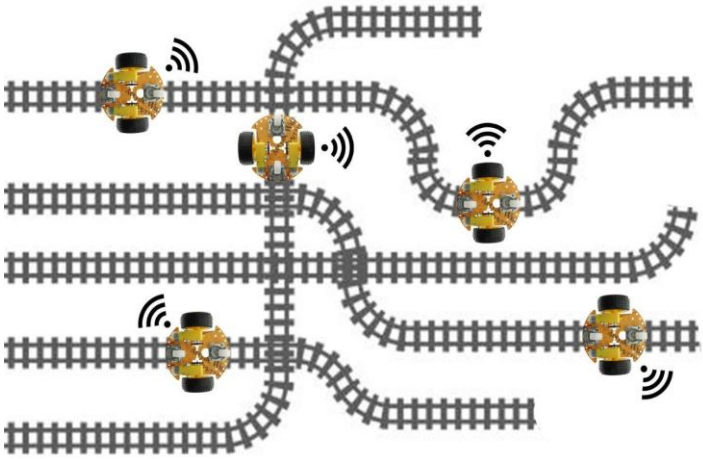
identified.Once the agent has identified a crack, it is intimated to the nearest base station for the track engineer to address the issue at the earliest.It also communicates to its nearest agents and alerts them regarding the identified setback. The system also tries to provide a safe environment for the locomotive system in the regions of animal crossing.

BACKGROUND AND MOTIVATION

Railway is the most essential form of transport in India, as it provides long-distance, comfortable travel within a budget for a commoner. According to the NCRB Annual Report 2020, there were 27,987 train accidents in 2019, 13,018 in 2020. The report also revealed that as many as 11,986 railway passengers were killed and 11,127 were injured in these accidents during the past year of 2021. Accidents like these can happen to various reasons, one of the most prominent being the cracks in railway tracks. The very concept of the project lies within identifying the type of cracks on the tracks. They are of two types, one being the intentional gaps left on the tracks for thermal expansion during summer. The other being the faulty cracks which can cause a catastrophe as dangerous as derailment of the train of the tracks. The current system lacks any kind of novel technology to identify and rectify faulty cracks. This project tries to work on this problem and provide a real time solution. The project also takes the vast scale of the domain into consideration. So it tries to provide a solution that requires minimal human interference and mobile management.

METHODOLOGY

The system is divided into clusters. Each cluster has a base station and a fixed number of agents. These agents follow swarm robotic architecture. The agents are deployed on the tracks. The number of agents in a cluster is determined by the maximum communication range of an NRF module which is the communication unit used in the product. The aforementioned can be extended up to 3 km. The cluster also has a fixed number of free robots that replace the working agents in case of a fault or low battery. The designed UGV is a four-wheeled bot that is deployed directly onto the railway tracks.



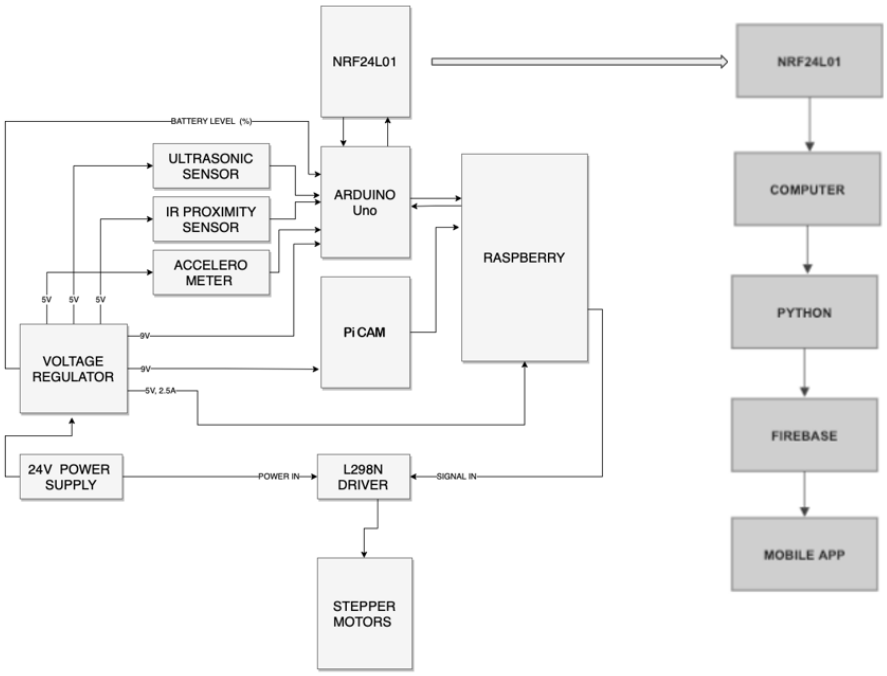
SYSTEM ARCHITECTURE

The system mainly comprises the communication unit and the sensor data processing unit. Communication is responsible for the efficient exchange of data between the agents as well as the base station. The agents communicate to the nearest bots and base station in the case of any kind of hindrance identified by the sensor data processing unit.

The sensor data processing unit is responsible for the detection of different types of cracks, obstacles, and faults in the agent itself. Various sensors are integrated and implemented for fault detection. The data is fed to the Arduino board which handles the communication and sensor data processing tasks.

The raspberry module is integrated in the system for image processing. The project aims toward efficient animal crossing detection which is common on the Indian railway tracks due to the terrains it passes through. The agents will be equipped with an FPV camera, which captures images when it encounters live object detection. Then running efficient image processing algorithms it identifies the subject in front of it and starts over only when the path is clear.

The model is also equipped with a GPS module which helps 7the other agents know its current location when it sends out data in case of fault detection. This helps other agents to reach that specific location and aid it. It also helps the base station to know the location of the fault.



COMMUNICATION UNIT

The communication unit is set up primarily using an NRF24L01 module. The inter-system communication happens in the case of:

- Crack detection
- Obstacle detection
- Animal crossing detection
- Agent failure

On the onset of any of the aforementioned conditions,the agent sends its location, proximity, X-Y coordinate values of accelerometer, IR proximity, temperature values to the assigned base station and nearby agents within communication range. A single RF channel with multiple communication pipelines is established with a dedicated pipeline for each of the agents. The agents constantly send data to their respective cluster base station which can be

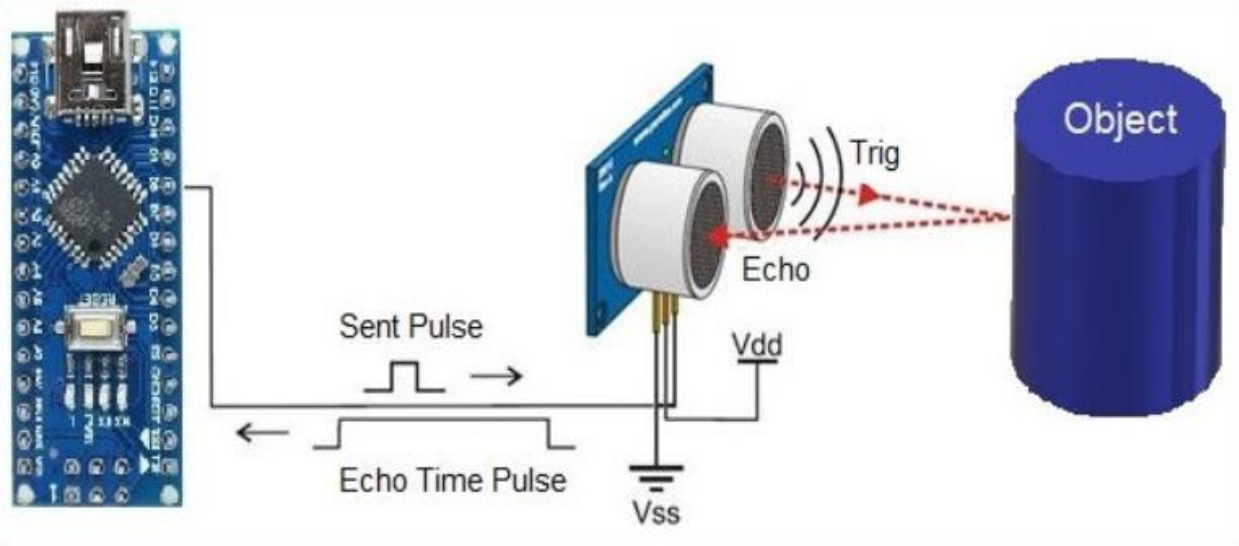
viewed on the android application. It shows a warning signal along with a trigger alarm when an agent detects an anomaly. It also communicates to the nearby agents when an anomaly occurs. A single agent can communicate up-to 6 agents at a time and has a maximum communication range of 3 km.

SENSOR AND PROCESSING UNIT

The sensor unit mainly comprises:

- Ultrasonic sensor (Obstacle detection)
- IR Proximity sensor (Crack detection)
- MPU6050 (Fault detection)

The ultrasonic sensor mounted in front of the agent continuously sends trigger pulses in front of it till certain proximity. In case of occurrence of an obstacle, it receives an echo back, meaning the pulse has hit a physical object and the agent confirms detection of an obstacle on the track.



ANDROID APPLICATION

An Android application is developed to alert the officials and the concerned individuals regarding the emergency condition that has to be addressed fast. The developed app gives the provision to know the different values of the sensors which include an IR sensor, a combined sensor module of Temperature and Accelerometer called MPU 6050, and a GPS module. The app gives an alert alarm and a warning image as the sudden response to cracks or any other obstacle encountered by the bot during their routine crack detection checkup. It consists of a parallel display providing a side-by-side view of the status of each bot. The app also consists of the two buttons named BOT_1 and BOT_2 which once clicked will lead to the live location of the robot where they are present. The approximate distance between the two robots will be displayed between the two buttons. This app is basically an interface that helps the authorities to know when to start the accident prevention steps. Basically, this app provides full-fledged access to know all the details regarding the robot including their nearest distance. The alarm system in the application causes a sudden alert throughout and constantly rings until an immediate step is taken. This app will be provided only to the Railway Authority officers as there are high chances of this app getting misused. The distance between the coordinates namely Latitude and the Longitudes are calculated using the Haversine formula. When one robot is getting tampered with or derailed, then the nearest robot will come to assist the damaged robot. The nearest distance is hence calculated with the help of the haversine formula.

ANIMAL DETECTION UNIT

The pathways of the crack detection robots are medalled with a plethora of obstacles and dangers. The bot actively responds against non-living obstacles using its array of proximity sensors. The next challenge are the living obstacles and dangers caused in specific locations like animal crossings and wildlife sensitive areas. Elephant crossings along various railway tracks can cause untimely disruptions in the proper movement of the robot. An efficient way to tackle this problem is a real-time animal detection system that takes in live camera feed and detects elephant crossings present in the frame. On the detection of an elephant the robot is signaled to halt its movement and wait for a safer environment to continue its movement by analyzing the live camera feed. The process of animal detection is carried out on a Raspberry Pi module attached onto the robot. Upon detection the Raspberry Pi is programmed to provide a motor signal to the required L298N motor driver module. Detecting an object entails both stating that an object belonging to a specified class is present, and localizing it in the image. The location of an object is typically represented by a bounding box.

RESULTS AND DISCUSSION

The prototype was successfully run on the simulated railway tracks and the results suggest that the final model can be successfully run on the actual railway track along with the implementation of auto-detachment feature from the track feature. The trains will be set up with proximity sensors and using the geo-location of the trains, when the train is within a proximity threshold distance, the agent proceeds to detach itself off the tracks onto the surface of the tracks. The agent uses actuators to lift itself off the track, then scissor hinges flips the wheels inside the tracks and the actuator proceeds to rest the agent onto the base of the tracks. The agent then lifts back up and places itself back onto the track when the train leaves the proximity threshold region.

The integration of the Indian railway database with the model can make the project extendable across the railway network of the country. With access to geo-location of trains and the thermal expansion tracks along with the train timings and delays, the efficiency of the model can be increased exponentially.

The success of the whole project revolves around the auto-detachment feature. A number of alternatives were brainstormed and discussed out, from the spider-bot model to linear actuators stand alone. After extensive research, cross-hinges along with linear actuators

along the wheels was confirmed to be the most feasible and suitable model for our project. This made sure there was an equal distribution of weight throughout the base of the robot. It also ensured a sturdy, fool-proof and hasty mechanism.

The inclusion of animal detection, arose from the obstacle detection module, when the presence of animal crossing was taken into consideration. When the obstacle detection module was being implemented, it was realized, the agent has to be cautious about not just the static, but the dynamic(animals) obstacles which may hinder the movement of robot on the track. Thus, the concept of image processing was brought up, which will help the agent identify if any kind of animal crossing is going on, on the tracks in front of it. Based on the type of animal crossing and the behaviour the animal exhibits, the robot can accordingly decide the amount of time it has to halt, before restarting its movement.

HIGHLIGHTS

This project consist of many features which enhances the credibility and use of the system. An application that supports the real-time data transfer and an alarm system is added to the app. As a next step to future implementations we have included an advanced feature of image processing. The app which is mentioned above consist of certain features which include an alarm and specific values of the corresponding cracks and defects which are found on the rail. Each feature contains a specific threshold beyond which the alarm starts to beep and a warning message will be popping up. Image Processing section will be dealing with the objects encountered by the bot. The proposed system is a swarm system and supports multiple bots and any damaged or derailed robot will be supported by the neighboring robot.

UTILIZATION CERTIFICATE

Certified that out of Rs ..... 48260/- ..... sanctioned by Centre for Engineering Research and Development of APJ Abdul Kalam Technological University towards financial assistance for the student project titled ' A SWARM BASED AI AIDED WHEEL BOT SYSTEM TO DETECT CRACKS ON RAILWAY TRACKS ', an amount of Rs ..... 41110.3/- ..... was utilized for the purpose for which it was sanctioned, leaving a balance of Rs. ..... 7149.7/- ..... at the close of ..... 12-09-2022 ..... as shown in the Statement of Expenditure annexed.

For SUBHASH CHANDRAN ASSOCIATES
CHARTERED ACCOUNTANTS

S ABHILASH CHANDRAN B.Com, FCA
PARTNER. (M. No. 223576)
FRN 004095S

Name & Signature of Principal Investigator	Name & Signature of Head of the Institution	Name & Signature of Accounts officer/ Chartered Accountant
	Dr. ANITHA G. PILLAI PRINCIPAL SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY	UDIN 23223576BGYJBM5227

SUBHASH CHANDRAN ASSOCIATES
CHARTERED ACCOUNTANTS
KOCHI-36

Office Seal

KERALA STATE COUNCIL FOR SCIENCE, TECHNOLOGY AND ENVIRONMENT
An Autonomous body of the Government of Kerala

KSCSTE - Student Project entitled –**"Data abstraction of vehicles on crashing (DAVOC)"** submitted by Mrs.Hazel Elsa John, Assistant Professor, Electronics & Communication,SCMS School Of Engineering And Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576 Kerala as PI and Ajmal P S,Akshay Kumar T V,Adithyan A S,Hafis Abdul Rahimas student investigator(s) - financial assistance - Orders issued.

Council (P) Order No366/2021/KSCSTE Dated: Thiruvananthapuram,05/10/2021

Ref: - 1. Decision of the 64th SP Committee meeting dated December 13, 2019 on item No. SP- 64_ (01300 /SPS 64/2019/KSCSTE)

2. KSCSTE/592/2020-SP

ORDER

Kerala State Council for Science Technology and Environment (KSCSTE) is operating a programme for supporting student projects in colleges and university departments. Mrs.Hazel Elsa John, Assistant Professor, Electronics & Communication, SCMS School Of Engineering And Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576, Kerala, has submitted a student project as PI with Ajmal P S,Akshay Kumar T V,Adithyan A S,Hafis Abdul Rahimas student investigator(s) for financial assistance. The 64th SP Committee meeting dated December 13, has sanctioned **₹9800/-(Rupees Nine thousand and eight hundred only)** for the conduct of the above said project. The PI has submitted the final report and financial statements after completion of the project.

KSCSTE has verified the submitted documents and is pleased to accord sanction for the release of **₹7249/-(Rupees seven thousand two hundred and forty nine only)**towards financial assistance for the student project titled –**"Data abstraction of vehicles on crashing (DAVOC)"**submitted by Mrs.Hazel Elsa John, Assistant Professor, Electronics & Communication, SCMS School Of Engineering And Technology Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576, Kerala.The amount will be disbursed to **The Principal, SCMS School Of Engineering And Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576, Kerala**by means of Electronic Fund Transfer as per their bank details given below.

Beneficiary Account Name	**SCMS School of engineering and technology**
Beneficiary Account Number(SB/CC)	**345801010030000**
Beneficiary IFSC code	**UBIN0558885**
Name of bank	**Union bank of India , Palissery**
Beneficiary Address	**The Principal, SCMS School Of Engineering And Technology Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576 Kerala**

File No.KSCSTE/592/2020-SP

Beneficiary Phone No. 9446763487

Beneficiary E-mail ID praveensal@scmsgroup.org

The expenditure in this regard will be met from the Council fund **(III) Schemes and Programmes of KSCSTE - Student project scheme.**

K P SUDHEER
EXECUTIVE VICE PRESIDENT,KSCSTE

To

The Principal, SCMS School Of Engineering And Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576, Kerala

Copy to:

Mrs.Hazel Elsa John, Assistant Professor, Electronics & Communication, SCMS School Of Engineering And Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576
Kerala

Ajmal P S,Akshay Kumar T V,Adithyan A S,Hafis Abdul Rahim, Student(s),Bachelor of Technology (BTech), Electronics & Communication, SCMS School Of Engineering And Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683 576, Kerala

The Cash Section KSCSTE, Auditors file, Stock File/Office Copy

Kerala State Council for Science, Technology and Environment

16.01.2020

Prof (Dr.) K.P. Sudheer
Executive Vice President
KSCSTE, Pattom

Letter No. 01300 /SPS 64/2019/KSCSTE

Dear Mrs. Hazel Elsa John,

Sub:-Financial assistance for Student Project scheme of KSCSTE reg.
Ref:-Your application received under Student Project scheme

This is to invite your attention to the reference cited and to inform that the project proposal titled "**Data abstraction of vehicles on crashing (DAVOC)**" submitted by Mrs. Hazel Elsa John as PI and Ajmal P S,Akshay Kumar T V,Adithyan A S,Hafis Abdul Rahim as student investigator(s) has been approved. An amount of ₹9800/- is sanctioned by the Council. The budget estimate of the project is as detailed below.

SL.NO.	ITEMS	AMOUNT(₹)
1	Consumables	8900
2	Minor equipments	400
3	Travel	200
4	Research Literature & Documentation	200
5	Others (for analysis)	100
	Total	9800

The PI has to submit the signed Terms and Conditions (as per the guidelines) and the date of start of the project within two weeks to the undersigned. The project should be completed within six months and submit the certified soft copy of the final report (in pdf to **sed.kscste@kerala.gov.in**), audited Statement of Expenditure and Utilization Certificate counter signed by the Head of the Institution for releasing the grant. **The format for final report, SE and UC can be downloaded from www.kscste.kerala.gov.in .**

Thanking you.

Yours sincerely,

Prof (Dr.) K.P. Sudheer

To

Mrs. Hazel Elsa John, Assistant Professor, Dept. of Electronics & Communication, SCMS School Of Engineering And TechnologyVidya Nagar, Palissery, Karukutty, Ernakulam - 683 576

Copy to:

The Principal, SCMS School Of Engineering And TechnologyVidya Nagar, Palissery, Karukutty, Ernakulam - 683 576

Ajmal P S,Akshay Kumar T V,Adithyan A S,Hafis Abdul Rahim, Student(s), Bachelor of Technology (BTech) Electronics & Communication, SCMS School Of Engineering And TechnologyVidya Nagar, Palissery, Karukutty, Ernakulam - 683 576

Sasthra Bhavan, Pattom P.O., Thiruvananthapuram - 695 004, Kerala State, India
Tel : 0471 - 2548200-09, EVP - 2543557, 2548222, MS - 2534605, 2548220, CoA - 2543556, 2548248
Fax : 0471 - 2540085, 2534605 e-mail : ksceste@gmail.com, www.kscste.kerala.gov.in

Statement of Account

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY EDUCATIONAL INSTIT

C/O SCMS SCHOOL OF ENGINEERING & T
SCMS CAMPUS PALISSERY
PADUAPURAM P O ERNAKULAM
ERNAKULAM
KERALA
INDIA
683582
9186589054713
SUBHA@SCMSGROUP.ORG

City
State
Country
Zip
Mobile No
E-mail

Statement Date 30/11/2021 09:31

Union Bank of India

Branch	PALISSERY
Customer Id	137305091
Account No	345801010030000
Account Currency	INR
Account Type	Current Account
MICR Code	
IFSC Code	UBIN0558885

Records from 1 to 149. No more records available.

Statement Period From -23/11/2021 To 30/11/2021

Date	Remarks	Tran Id	UTR Number	Instr. ID	Withdrawals	Deposits	Balance
25/11/2021	NEFT:Mr NOEL JOSEPH GOMEZ SBIN321329393862	S32261023	Sender No:SBIN321329393862			20,250.00	1,83,81,384.70
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26/11/2021	NEFT:SANIL P B SIBLN21330157518	S40833044	Sender No:SIBLN21330157518			1,80,000.00	1,85,61,584.70
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26/11/2021	UPIAB/133012389259/CR/ASHKAR /SBIN/ashkarsulaiman	S41503945	-			20,600.00	1,85,82,384.70
26/11/2021	NEFT:RAZORPAY SOFTWARE PRIVATE LIMITED AXISCN01069	S43165614	Sender No:AXISCN0106 972557			1,67,650.00	1,87,50,034.70
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26/11/2021	WEEKEND PASS	AA784416	-			4,650.00	1,87,76,934.70
26/11/2021	MUHAMMED LAMY MTC/778	AA784416	-			30,000.00	1,88,06,934.70
26/11/2021	IMPSAB/133016809180/UBIN0558885/94974 63767	S46400889	-			20,600.00	1,88,27,534.70
26/11/2021	NEFT:KSCSTE SBIN421330046461	S47761762	Sender No:SBIN421330046461			7,000.00	1,88,34,534.70
26/11/2021	NEFT:KSCSTE SBIN421330046470	S47763606	Sender No:SBIN421330046470			7,249.00	1,88,41,783.70
26/11/2021	NEFT:KSCSTE SBIN421330046465	S47763873	Sender No:SBIN421330046465			7,441.00	1,88,49,224.70
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