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BOOK/CONFERENCE DETAILS 2018

Sl No:	Name	First Author	Second Author	Third Author	Fourth Author	INDEXING
1	Dr.Vidya Chandran	CME1801				conference
2	Dr.Varun G Menon	CCSE1801	CECE1801			conference
3	Dr.Sunil Jacob	CEC1801				conference
4	Dr.Saira Joseph			CECE1801		conference
5	Vinoj P G				CECE1801	conference

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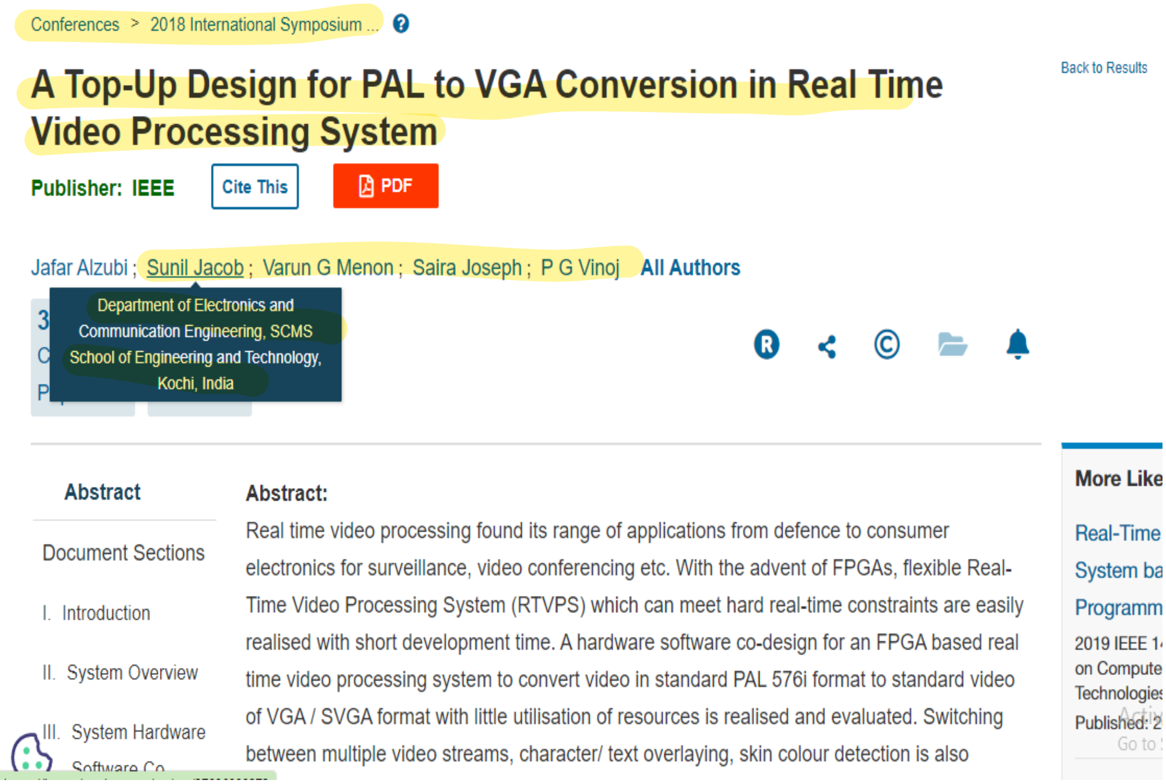

Conferences > 2018 International Symposium ...

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A Top-Up Design for PAL to VGA Conversion in Real Time Video Processing System

Publisher: IEEE

Jafar Alzubi ; Sunil Jacob ; Varun G Menon ; Saira Joseph ; P G Vinoj **All Authors**

Department of Electronics and Communication Engineering, SCMS School of Engineering and Technology, Kochi, India

Abstract:
Real time video processing found its range of applications from defence to consumer electronics for surveillance, video conferencing etc. With the advent of FPGAs, flexible Real-Time Video Processing System (RTVPS) which can meet hard real-time constraints are easily realised with short development time. A hardware software co-design for an FPGA based real time video processing system to convert video in standard PAL 576i format to standard video of VGA / SVGA format with little utilisation of resources is realised and evaluated. Switching between multiple video streams, character/ text overlaying, skin colour detection is also

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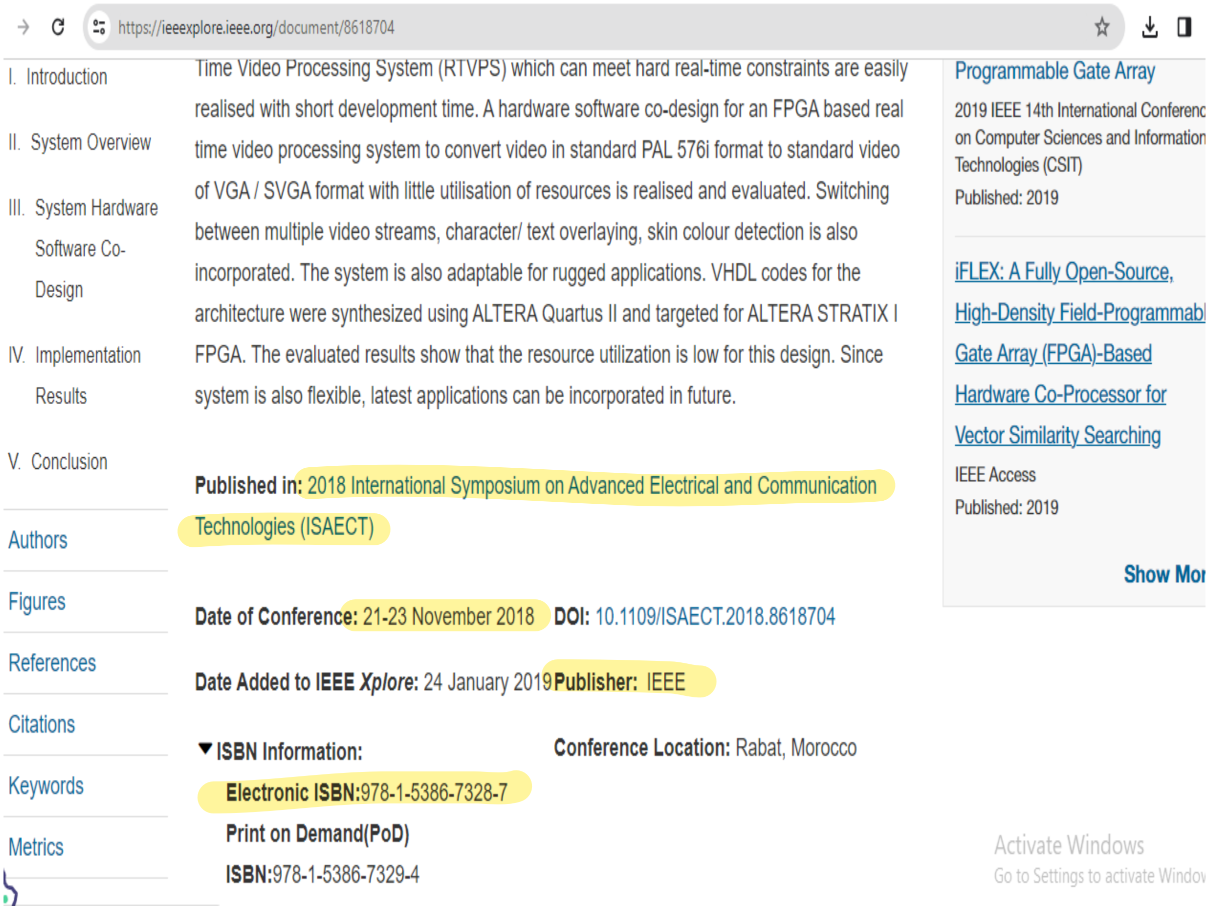

Time Video Processing System (RTVPS) which can meet hard real-time constraints are easily realised with short development time. A hardware software co-design for an FPGA based real time video processing system to convert video in standard PAL 576i format to standard video of VGA / SVGA format with little utilisation of resources is realised and evaluated. Switching between multiple video streams, character/ text overlaying, skin colour detection is also

incorporated. The system is also adaptable for rugged applications. VHDL codes for the architecture were synthesized using ALTERA Quartus II and targeted for ALTERA STRATIX I FPGA. The evaluated results show that the resource utilization is low for this design. Since system is also flexible, latest applications can be incorporated in future.

Published in: 2018 International Symposium on Advanced Electrical and Communication Technologies (ISAECT)

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Programmable Gate Array
2019 IEEE 14th International Conferenc
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Published: 2019

iFLEX: A Fully Open-Source, High-Density Field-Programmabl Gate Array (FPGA)-Based Hardware Co-Processor for Vector Similarity Searching
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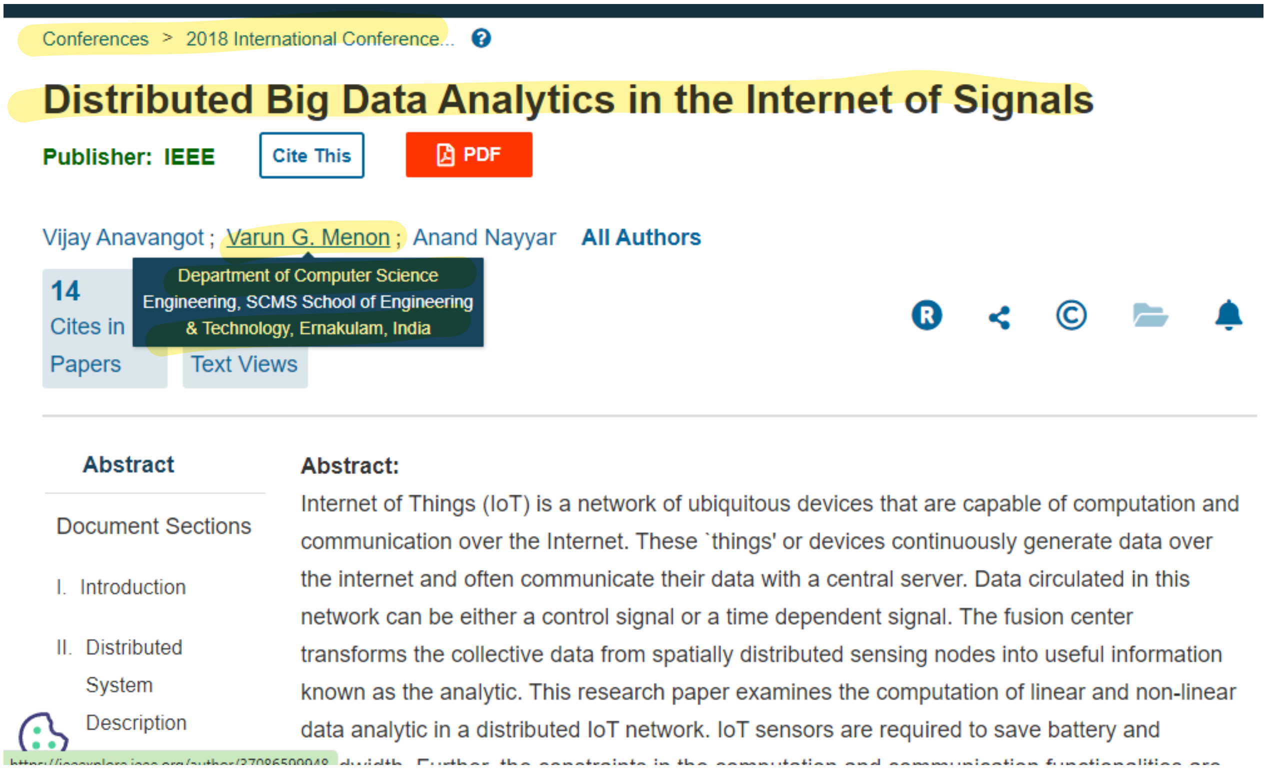


Distributed Big Data Analytics in the Internet of Signals

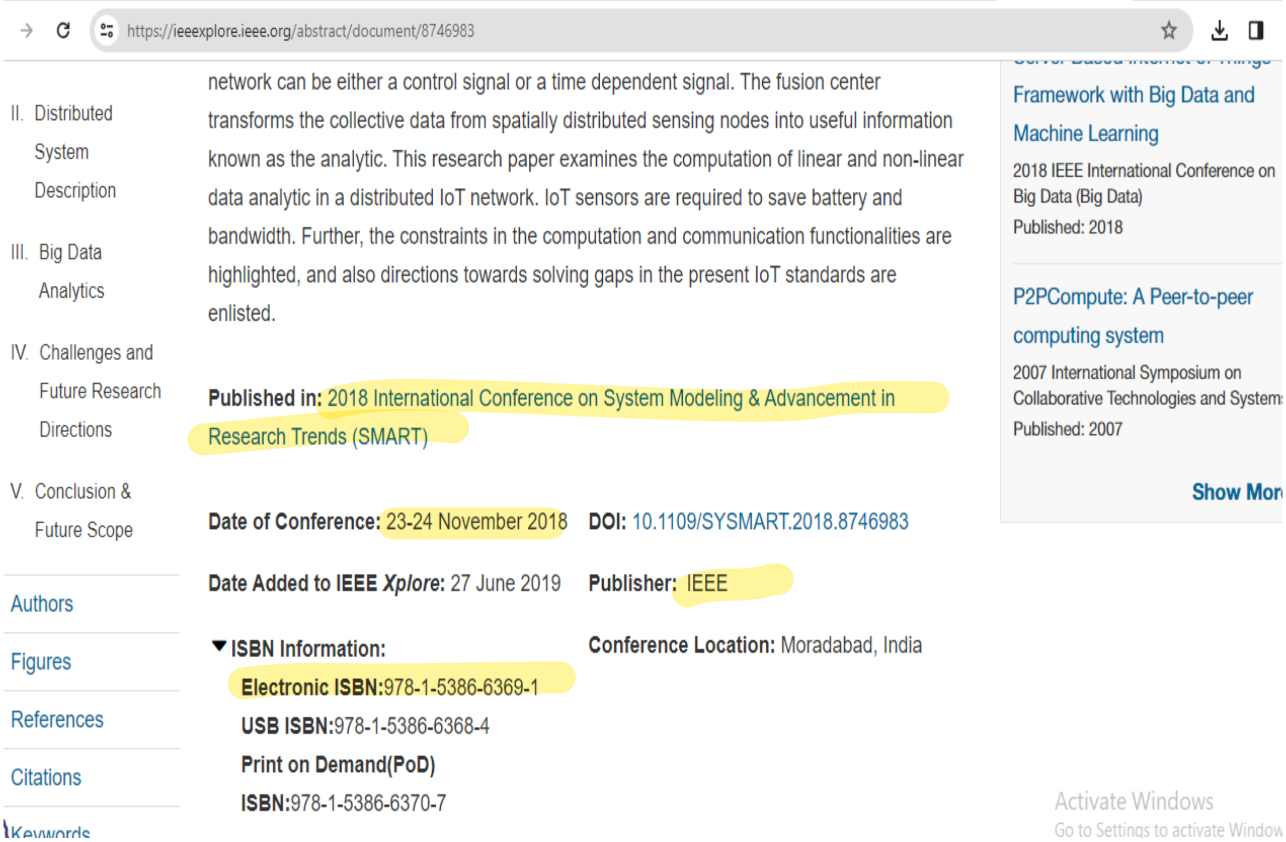
Publisher: IEEE

Vijay Anavangot ; Varun G. Menon ; Anand Nayyar **All Authors**

Department of Computer Science Engineering, SCMS School of Engineering & Technology, Ernakulam, India

Abstract:

Internet of Things (IoT) is a network of ubiquitous devices that are capable of computation and communication over the Internet. These `things' or devices continuously generate data over the internet and often communicate their data with a central server. Data circulated in this network can be either a control signal or a time dependent signal. The fusion center transforms the collective data from spatially distributed sensing nodes into useful information known as the analytic. This research paper examines the computation of linear and non-linear data analytic in a distributed IoT network. IoT sensors are required to save battery and



network can be either a control signal or a time dependent signal. The fusion center transforms the collective data from spatially distributed sensing nodes into useful information known as the analytic. This research paper examines the computation of linear and non-linear data analytic in a distributed IoT network. IoT sensors are required to save battery and

bandwidth. Further, the constraints in the computation and communication functionalities are highlighted, and also directions towards solving gaps in the present IoT standards are enlisted.

Published in: 2018 International Conference on System Modeling & Advancement in Research Trends (SMART)

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Prediction of interaction between inline and cross flow responses of cylinder under vortex induced vibration

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Prediction of interaction between inline and cross flow responses of cylinder under vortex induced vibration.

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ABSTRACT

Extensive research on vortex induced vibration of cylinders has revealed that inline vibration has significant impact on the shedding pattern and also on the amplitude of cross flow vibrations. Interaction between the responses in inline and cross flow directions is still not fully understood. The paper presents a simplified method for understanding the interaction between these two responses using two dimensional computational fluid dynamics (CFD) simulations. This paper addresses two cases where in the cylinder is modeled with a single degree of freedom (SDOF) in CF direction and two degrees of freedom (TDOF) in both CF and IL directions. The trends of variation of hydrodynamic and structural parameters have been analyzed to understand the effect of the second degree of freedom on cylinder response and hydrodynamic force coefficients. The shedding pattern has also been analyzed in the study. A 17 % increase in the value of C_L has been observed in the TDOF case. The results show that the cylinder with SDOF is more prone to lock in vibration. This phenomenon may be related to the shifting of shedding pattern from 2S to 2P when the inline motion is arrested.

NOMENCLATURE

Symbol	Definition (unit)
D	Diameter of the cylinder (m)
V	Current velocity (m/s)
m^*	Mass ratio
f_v	Frequency of vortex shedding (hz)
St	Strouhal number
f_n	Natural frequency of cylinder in water (hz)
f_{nCF}	Natural frequency of cylinder in CF direction (hz)
f_{nIL}	Natural frequency of cylinder in IL direction (hz)
f_{CF}	Frequency of oscillation of cylinder in CF direction (hz)
f_{IL}	Frequency of oscillation of cylinder in IL direction (hz)
f_{oscC_L}	Frequency of oscillation of Lift coefficient (hz)
f_{oscC_D}	Frequency of oscillation of Drag coefficient (hz)
η_b	Ratio of CF and IL direction natural frequencies

1. INTRODUCTION

Vortex induced vibration (VIV) of marine risers has ever been an extensively researched topic. But most of the studies have concentrated on understanding the wake characteristics and estimating hydrodynamic loading and response of either stationary cylinder or cylinder with SDOF [1]. Few results have been reported for study of hydrodynamic response of cylinder with TDOF in both in-line (IL) and cross-flow (CF) directions. ILvibration has significant impact on the shedding pattern and also on the amplitude of CF vibrations [2]. The first of its kind discussions were reported in the case of flow around cylinder with TDOF [3]. They established the effect of reduced velocity (U_r) on the effect of forced and free 2dof response [3]. The effect of IL response on CF response depends on the ratio of natural frequencies in both directions ($\eta_b = \frac{f_{nCF}}{f_{nIL}}$). During lock in, if the natural frequency in the IL direction is twice that in the CF direction, resonance occurs in both directions leading to premature failure of the riser [4]. Also it has been observed that IL response amplitude is a function of U_r and stability parameter, where as the CF response amplitude is a function of U_r and flow velocity [5]. Wake characteristics, hydrodynamic force coefficients and response vary significantly when both IL and CF vibrations occur simultaneously. Hence there is a need for prediction of response that hold good for the combined IL and CF vibration.

2. PROBLEM DESCRIPTION

In the present paper a riser model with outer diameter 0.076 m has been numerically analyzed using two dimensional (2D) computational fluid dynamics (CFD).Specifications of the riser and the flow condition in listed in Table 1. The incoming flow velocity is fixed as 0.5 m/s to maintain the flow regime uniform at Re = 3.8 x 10^4 which corresponds to the ocean condition encountered by a real marine riser used for petroleum extraction in offshore industries [6]. In this paper an effort has been made to study the effect of IL vibration on the amplitude of CF vibration and also on the wake characteristics.

Table 1 Riser model specifications and flow characteristics

Properties	Values	Units
Diameter (*D*)	0.076	m
Aspect ratio (*L/D*)	13.12	-
Flow velocity (*V*)	0.5	m/s
Reynolds Number of flow (Re)	3.8 x 10^4	-
Mass ratio (m*)	0.66	-

2.1. MATHEMATICAL MODEL

The riser has been modeled as a 2D cylinder with TDOF in the CF and IL directions. The equations of motion for the riser can be represented as

$$m\ddot{Y} + c\dot{Y} + kY = F_{\mathrm{L}}(t) \quad (1)$$

$$m\ddot{X} + c\dot{X} + kX = F_{\mathrm{D}}(t) \quad (2)$$

where Y is the displacement in CF direction and X is the displacement in the IL direction. The excitation forces are lift force, $F_{\mathrm{L}}(t)$ and drag force $F_{\mathrm{D}}(t)$. The excitation forces are periodic in nature due the alternate shedding of vortices, which causes the riser to oscillate in CF as well as IL directions. The riser is observed to oscillate with frequency equal to frequency of vortex shedding (f_{v}) in the CF direction and at double the frequency in the IL direction during lock in. Lock in can be defined as the resonance condition during which the vortex shedding frequency lock on to the natural frequency of the riser in the cross flow direction. A simple representation of the mathematical model of riser with TDOF is represented in Figure. 1.

The riser is modeled with zero structural damping in the CF and IL directions. k_x and k_y are stiffness coefficients in the IL and CF directions respectively. In the present study k_x= k_y. For such a specific case the natural frequencies in both directions will be same and hence $\eta_{\mathrm{b}} = 1$.

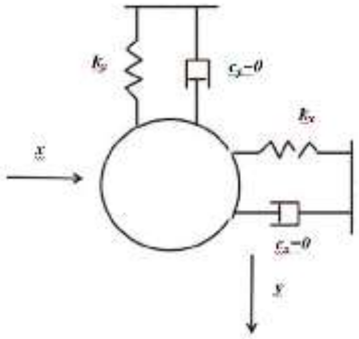
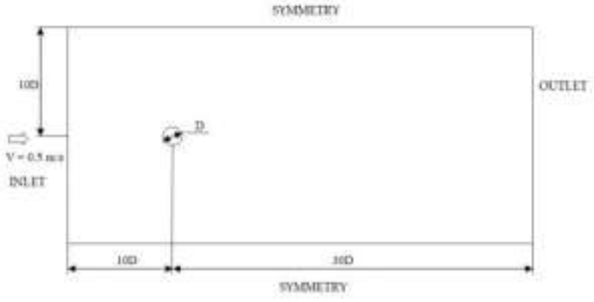


Figure 1 Representation of mathematical model of riser with TDOF.

2.2. FLUID DOMAIN

Figure 2 (a) shows the computational domain for the CFD simulation of VIV of an elastically mounted cylinder with TDOF. The origin of the Cartesian coordinate system is located at the center of the cylinder. The length of the domain is 40*D* with the cylinder located at 10*D* away from the inlet boundary. The cross flow width of the domain in 20*D* with the center of the cylinder at the middle. Detailed views of the mesh around the cylinder along with the computational domain after meshing have been shown in Figure 2 (c) and (b) respectively. There are 307 nodes around the circumference of the cylinder and the minimum element size near the rigid wall boundary has been computed from boundary layer theory to be 0.0001D [7]. The non-dimensional element size represented as $y+$, next to the cylinder surface is found to be less than unity. For cylinder wall a no slip boundary condition has been applied assuming the surface to be smooth. Inlet boundary has been treated has velocity-inlet with inflow velocity, V = 0.5 m/s. Outlet boundary has been treated as pressure outlet, the gradients of fluid velocity are set to zero and the pressure with zero reference pressure. On the two transverse boundaries symmetry boundary condition has been applied. Grid independency study has been carried out for the present grid in the previous work done by the authors [8].



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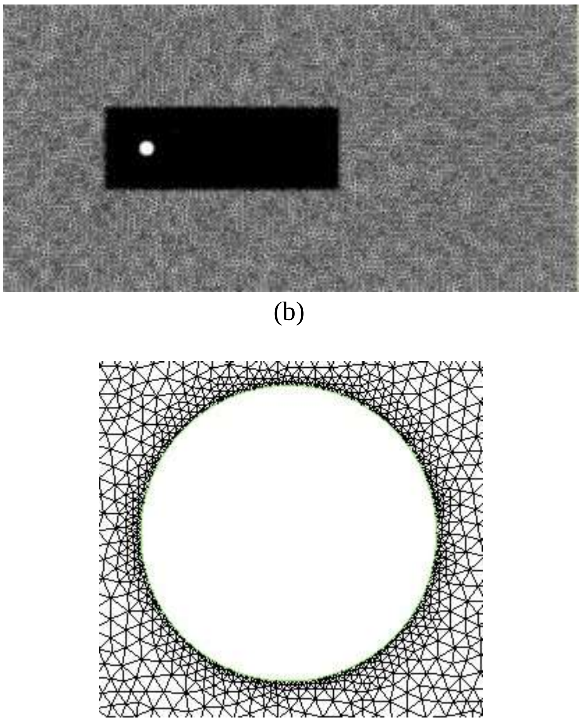


(b)

(c)

Figure 2 (a) Computational domain (b) computational mesh (c) mesh around the cylinder

2.3. FLOW MODEL

Numerically this problem has been treated as a case of two way fluid structure interactions (2way FSI). Modeling and meshing has been performed in ANSYS ICEM CFD and solving using ANSYS FLUENT. Flow around the cylinder is modeled using the transient, incompressible Navier-Stokes equation based RANS solver with k – ω SST as the turbulence model. RANS solver does the virtual averaging of velocities over an interval of time and hence for a specific interval the velocity vector appears to be constant in a RANS solver. In the present work an optimized fine grid is used to compensate for this drawback of the solver enabling it to capture the physics of Von-Karman Street eddies.

The governing equations are discretized using finite difference method. Non iterative time advancement (NITA) scheme with fractional time stepping method (FSM) has been chosen for pressure-velocity coupling of the grid. A least squares cell (LSC) based scheme has been used for gradient in spatial discretization and a second order upwind scheme as convective scheme.

2.4. STRUCTURAL MODEL

An elastically mounted cylinder can be mathematically represented by Eq. (1) and (2). These equations of motion are solved using a six degrees of freedom solver (6DOF), an integral part of the main solver by defining the cylinder as an object with TDOF in transverse direction. A user defined function (UDF) compiled in C programming language has been hooked to the cylinder dynamic boundary conditions. The governing equations for the motion of the center of gravity of the cylinder in the CF and IL directions are solved in the inertial coordinate system. Velocity in the CF and IL directions are obtained by performing integration on Eq. (3) and (4)

$$\ddot{Y} = \frac{1}{m}\sum F_{\mathrm{L}} \tag{3}$$

$$\ddot{X} = \frac{1}{m}\sum F_{\mathrm{D}} \tag{4}$$

where $\ddot{X}$ and $\ddot{Y}$, are accelerations in the IL and CF direction respectively, m is the mass of the cylinder and F, resultant fluid force acting on the cylinder in the respective direction. Position of the center of gravity of the cylinder (CG) is updated after solving the equations of motion of a spring mass system represented by Eq. (1) and (2). Mass of the cylinder is given in the UDF as

$$m = m_{\mathrm{b}} + m_{\mathrm{a}} \tag{5}$$

$$m_{\mathrm{a}} = (1 + \mathrm{C_A})m_b \tag{6}$$

where m_{a} is the added mass and m_{b} is the mass of the cylinder. Added mass coefficient $\mathrm{C_A}$ for the aspect ratio of the present model is found to be equal to 0.7 [9].

Analysis has been performed assigning the cylinder TDOF with $k_x = k_y$ so that the natural frequencies of the cylinder in both directions remain equal. The results are compared with the case when the cylinder has only SDOF in the CF direction. Amplitudes of CF response are compared with existing results [8] and also the shedding patterns in both cases are analyzed.

3. RESULTS AND DISCUSSIONS

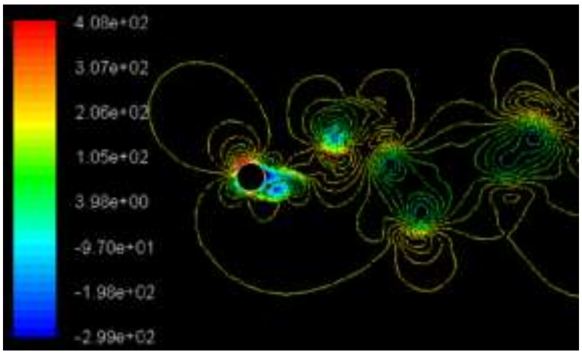
From the numerical analysis of cylinder with TDOF it has been observed that the hydrodynamic force coefficient in the CF direction, C_{L} shows an increase of 17.4% than that for SDOF case. This result is comparable with the findings of previous research in the field which shows an increase in the lift coefficient value by permitting an extra degree of freedom [10]. RMS value of C_{D} is almost constant for both cases with a very small decrease of 4% with TDOF case. C_{L} oscillates about zero with almost equal frequencies for both the cases. But the frequency of oscillation of C_{D} is lesser by 7.2% for TDOF case. The values of important hydrodynamic and structural parameters of both cases are shown in Table 2.

Table 2 Hydrodynamic and structural parameter off cylinder with SDOF and TDOF

Parameters	SDOF	TDOF ($\eta_b = 1$)
C_L	0.57	0.69
C_D	1.49	1.43
$f_{osc\ C_L} (f_v)$	1.16	1.14
$f_{osc\ C_D}$	2.5	2.32
f_{CF}	1.26	1.15
f_{IL}	-	3.28
St	0.18	0.17
Y/D	1.06	1.2
X/D	-	0.17

The non dimensional amplitude in the CF direction obtained with TDOF is 11.3% more than that with SDOF. *X/D* is approximately 0.2.Time histories of major parameters obtained from the SDOF analysis are shown in Figure 3 (a) – (c) and that for TDOF in Figure 4(a) – (c). Frequency of oscillation of the cylinder in the CF direction obtained from SDOF case is found to be more closer to the theoretical value of vortex shedding frequency obtained from the normal value of *St* = 0.2 ($f_v = 1.3$). For TDOF case the frequency of oscillation deviates from the vortex shedding frequency.

For TDOF case the frequency of oscillation of C_L and the oscillation frequency of cylinder in the CF direction remains same. In SDOF case C_L oscillation frequency remains same as that in the TDOF case, but the cylinder vibration frequency in the CF shifts towards the natural frequency of cylinder in CF direction.



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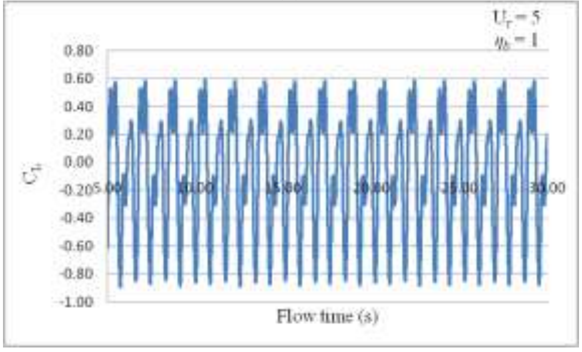

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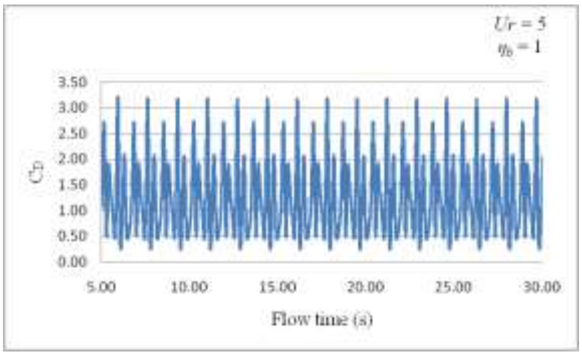

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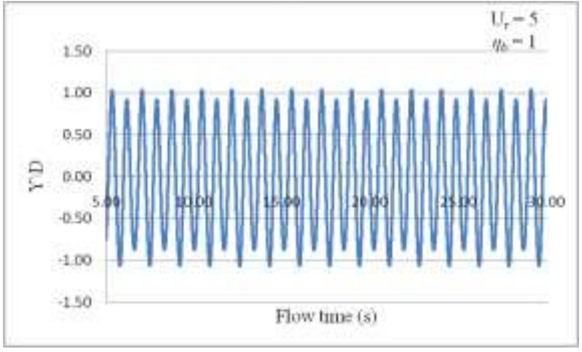
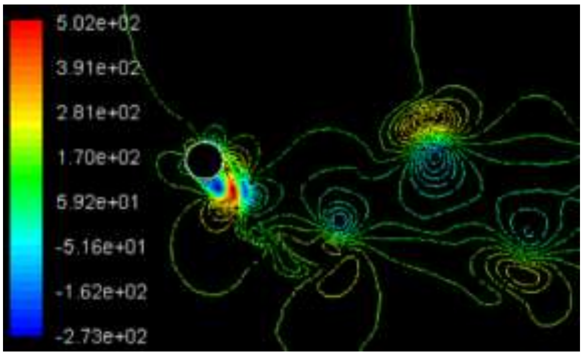


(d)

Figure 3 Pressure contours and Time histories of various hydrodynamic and structural parameters (a) Vortex shedding pattern behind cylinder with SDOF showing 2P mode (b) C_L of cylinder with SDOF (c) C_D of cylinder with SDOF (d) Motion history of cylinder with SDOF.

In the present analysis the natural frequency in both directions are specifically fixed to be equal to the theoretical value of vortex shedding frequency. Hence the phenomenon can be looked upon as the lock in of vortex shedding frequency on to the natural frequency of the cylinder. It can be concluded that a cylinder with SDOF is more prone to lock in vibration compared to that with TDOF.



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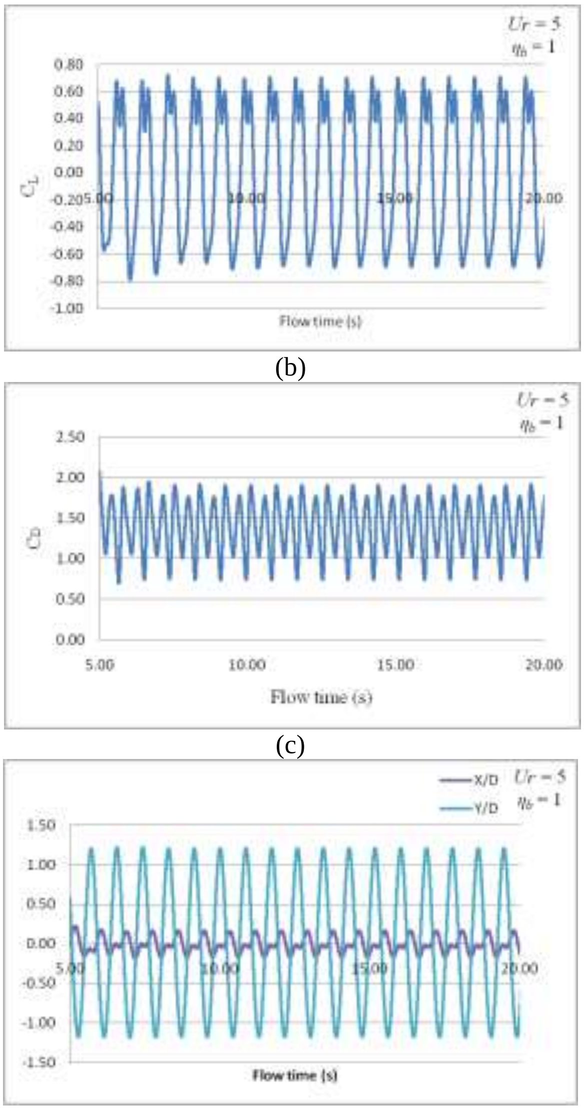

(b)

(c)

(d)

Figure 4 Pressure contours and time histories of various hydrodynamic and structural parameters (a) Vortex shedding pattern behind cylinder with TDOF showing 2S mode (b) C_L of cylinder with TDOF (c) C_D of cylinder with TDOF (d) Motion history of cylinder with TDOF.

This observation can be related to the shifting of the vortex shedding pattern from 2S to 2P mode when motion in IL direction is arrested. The shedding patterns for SDOF and TDOF cases are shown in Figure 3(a) and 4(a) respectively. *St* obtained also is with the range of normal value for cylinders during lock in. Even though the values of C_D for both cases are almost same, the oscillating frequency varies significantly.

The trajectory of oscillation of cylinder in TDOF case is represented in Figure. 5. A clear eight figure trajectory is observed which is typical for VIV of cylinders [10]. Also it has been observed that the motion the IL direction lags behind that in CF direction by a phase angle 30°. The represented trajectory in Figure 5 corresponds to 30° phase lag [11].

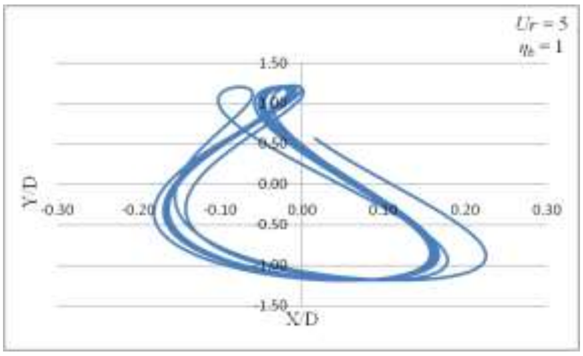

Figure 5 Trajectory of the cylinder with TDOF oscillating under VIV

4. CONCLUSIONS

Permitting an additional degree of freedom seems to have significant effect on the magnitude of lift coefficient but the frequency of oscillation of C_L remains constant for both the cases. C_D is independent of the degree of freedom of the cylinder but the frequency of oscillation varies significantly.

Oscillation amplitude of the cylinder in the CF direction is more in TDOF case which can be related to the increase in C_L.

It has been clearly observed that with SDOF the cylinder is more prone to lock in vibration since the vortex shedding frequency locks on to the natural frequency of the cylinder in the CF direction. But with TDOF no such shifting of frequency is observed. Shedding pattern shifts from 2S during TDOF motion to 2P when motion in IL direction is arrested.

An eight figure trajectory typical for VIV is obtained from the 2D simulation. Hence the efficacy of 2D CFD as a tool to predict response of cylinder with TDOF under VIV is accomplished. The observations made above are definitely strong inputs in the design and deployment of marine risers.

5. REFERENCES

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Sarga is a post graduate student in the in the department of Civil Engineering, SCMS School of Engineering and Technology, Ernakulam, India.