EMeDS 2018

Indo-US Workshop on
Emergency Medical Delivery Systems (EMeDS) Integrating Unmanned Aerial Vehicles

5-7 March 2018
CPDM, Indian Institute of Science,
Bengaluru, India

Workshop Venue: Center for Product Design and Manufacturing, Indian Institute of Science, Bangalore

The workshop will be held at the Center for Product Design and Manufacturing (CPDM), IISc. The department is located in the green campus of of IISc in the heart of Bengaluru and well connected to airport, train and bus stations.

Related information:

Host Institution: Design Division, Aeronautical society of India. (www.aerosocietyindia.in)

US Partner Institution: Villanova Center for Analytics of Dynamic Systems, Villanova University (www.villanova.edu; vcads.org)

Workshop Sponsor: Indo-US Science and Technology Forum (www.iusstf.org)

Workshop website: http://vcads.org/emeds

Background and Objectives of the Workshop

Medical Emergencies often occur on the road in congested urban areas or remote rural areas with rapid access to expert telephone emergency medical dispatch (108), but with delayed arrival of medical professionals and basic lifesaving equipment. In urban, rapidly developing India, congested traffic and road conditions are particularly challenging. Recent advancements in geospatial localization, optimization science, and drone technology have prompted technology companies to explore these methodologies for delivery of commercial goods. Adaptation of this concept to respond to deliver equipment and professional visual-guided coaching to lay first responders at road traffic accidents in congested urban or rural environments could be very impactful resulting in saving human lives and limbs. Additional important potential applications of drone technology in high traffic cities (e.g. rapid delivery of blood or vital organs for transplant) should be considered. When implemented, such systems and paradigm shift could be transformative, changing the emergency medical landscape and saving thousands of lives in India.

To address this challenge, we assembled a workshop to bring together highly interdisciplinary teams of experts from India, Europe, New Zealand, the UK and USA. Diverse expertise includes systems engineers, and experts in optimization science, unmanned aerial technology (e.g. navigation, control, aerodynamics), emergency and critical care medicine, Indian Emergency Response System and Telephone dispatch, the rural health mission and ministry of health in India, and the WHO.

The Design Division, Aeronautical Society of India (AeSI) and Villanova University Center for Analytics of Dynamic Systems(VCADS), USA are the coordinating partners of this joint workshop and bring together specific interest groups from academic, private and government institutions, both in India and the USA.

The top priority will be to describe and attain consensus on top priorities for design specifications and specific R&D needed to improve Emergency Medical Delivery systems integrating UAVs (EMeDS). Immediate, short and long term goals and metrics for success will be identified. Following the workshop, interdisciplinary working groups will be formed to accelerate EMeDS platform/process design and development activities in India, collaboratively connect these efforts with similar groups and entities in USA, and develop strategically focused proposals to submit to appropriate funding organizations.

Organizing Committee

Kota Harinarayana, PhD (Indian Coordinator)
Aeronautical Society of India, Bengaluru, India
C. 'Nat' Nataraj, PhD (US Coordinator)
Villanova University, Villanova, USA
Vinay Nadkarni, MD
Children's Hospital of Philadelphia, USA
Upendranath Vanam, PhD
National Aerospace Laboratories, Bengaluru, India
B. Gurumoorthy, PhD
Indian Institute of Science, Bengaluru, India
G. V. Ramana Rao, MD
GVK Emergency Management and Research Institute, Hyderabad, India
K. Ramachandra, PhD (Convener)
Director, National Design & Research Forum, India
Rakesh Kumar Treasurer, Design Division, Aeronautical Society of India

Workshop at a Glance

Invited Speakers	16
Thematic Groups	4
Students participating in group meetings	~10
Academic Faculty/Researchers participating in group meetings	~ 20
Industry participants	~10
Total number of participants	~60

Program Schedule- EMeDS 2018

(Each invited presentation lasts **25 minutes followed by 5 minutes Q&A**)

Monday 5 March 2018: Day 1

07:30-08:45 Breakfast

08:00-08:45 Registration

08:45-09:15 Inauguration with opening remarks from Workshop Coordinators (Prof C. Nataraj / Dr Kota Harinarayana); Prof. Gurumoorthy, IISc; Rep IUSSTF;Dr RK Tyagi, President AeSI; Dr VK Aatre, Former Head, DRDO) and participant introductions

Topic: (i) Emergency Medical Response

09:15-9:45 **Current status of Emergency Response Services in India**
Dr G V Ramana Rao, Director, Emergency Medicine Learning Centre and Research, GVKEMRI, Hyderabad

09:45-10:15 **Potential use of drones for emergency response**
Dr Vinay Nadkarni, Endowed Chair, Professor, Department of Anesthesia and Critical Care Medicine, Medical Director, CHOP Center for Simulation, Advanced Education, and Innovation

10:15-10:45 Tea Break

10:45-11:15 **Current state of emergency response for myocardial infarction and stroke (Heart Safe Community)**
Dr Aruna Ramesh, Professor & HoD, Emergency Medicine, MSR Hospital, Bengaluru

11:15-11:45 **Use of smart vehicle technology for optimizing emergency response**
Dr. Matthew R. Maltese, Research Assistant Professor, Children's Hospital of Philadelphia and the University of Pennsylvania, USA.

11:45-12:15 **Disaster response and systems of care**
Dr Brendan Carr, Director, Emergency Care Coordination Center, Washington DC, USA

12:15-13:15 **Panel Discussion on Topic**:
Moderators: Dr Vinay Nadkarni, Prof Nataraj
Panelists: Shri R. Raghu, ISRO; Shri Jitendra J Jadhav, Director NAL, Bengaluru; Dr Mukund Rao, NIAS, Bengaluru; Dr Jose Ferrer , American Heart Association International, USA; Dr Shyam Vasudeva Rao, Forus Health, Bengaluru
(5 minutes for each panelist to contribute more on topic, followed by 30 min of Q and A for Moderators, Panelists, Participants)

13:15-14:15 Lunch

Topic: (ii) Organ transport: Anticipated challenges for UAV delivery of Medical Equipment

14:15-14:45 **Needs, Operations and requirements of UAVs for delivery of organs and medical supplies**
Dr. Kota Harinarayana, Chairman, Design Division, AeSI, Bengaluru

14:45-15:15 **Transporting heart for heart transplant: One hospital's experience and its implications for UAV transport in the Indian context**
Prof Easwaran Subrahmanyam, Research Professor, Institute for Complex Engineered Systems
Carnegie Mellon University, USA

15:15-15:45 Tea Break

15:45-16:15 **Current challenges with Organ Ischemia and Organ Transport in India**
Dr Sunil Shroff, Managing trustee, MOHAN Foundation, Chennai

16:15-16:45 **Life box**
Prof Gurumoorthy, IISc, Bengaluru

16:45-17:15 **Technologies of Unmanned vehicles being developed at CSIR-NAL**
Mr PV Satya Narayana murthy, CSIR-NAL

17:15-18.15: **Panel Discussion on Topic**
Moderators: Prof Gurumoorthy, Prof Eswaran Subramanyam
Panelists: Prof. Raghunath IIMB; Dr K.R. Balakrishanan, Malar Hospital, Chennai; Dr Ramesh, MSR Hospital, Bengaluru; Rep- DIPAS, New Delhi (5 minutes for each panelist to contribute more on topic, followed by 30 min of Q and A for Moderators, Panelists, Participants)

1815-1830: **Summary of day's proceedings by Dr Kota Harinarayana & Prof C. Nataraj**

1830-1930: Break

1930-21:30 Dinner

Tuesday 06 March 2018: Day 2

07:30-08:45 Breakfast
08:45-09:15 Opening Remarks (Workshop Coordinators: Prof C. Nataraj / Dr Kota Harinarayana) and Goals for the Day

Topic: (iii) Emergency medicines/tools transport to remote areas

Related work in the lab and field: Progress and Pitfalls

09:15-9:45 **Research and development of UAV control: challenges with practical constraints**
Dr C. Nataraj, Professor & Director, Villanova Center for Analytics of Dynamic Systems, Villanova University, USA

09:45-10:15 **Optimizing access to defibrillators for cardiac arrest in the community: Planning for a drone network in Canada**
Dr Steve Brooks, Department of Emergency Medicine Queen's University at Kingston Canada

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10:15-10:45 Tea Break

10:45-11:15 **Perspective from New Zealand – challenges and opportunities in a country with diverse topography and different regulatory framework**
Dr Michael Shepherd, Auckland District Health Board, Auckland, New Zealand

11:15-11:45 **Development of drones at General Aeronautics**
Mr Abhishek Burman, CEO, General Aeronautics

11:45-12:15 **Drone Doctor Development- Work at IISc**
Prof S N Omkar, Head, UAV Lab, Department of Aerospace Engineering, Indian Institute of Science, Bengaluru

12:15-13:15 **Panel Discussion on Topic:**
Moderators: Dr Steven Brooks, Dr Kota Harinayana
Panelists: Dr Jose Ferrer, AHI, USA; Dr. Alex Thomas, AHPI, Dr UK Singh, Director, DEBEL, Prof. Manish Arora, CPDM, IISc; Shri Hanumantha Rayappa, ISRO

(Given 5 minutes each to contribute more on topic, followed by 30 min of Q and A for Moderators, Panelists, Participants)

13:15-14:15 Lunch

Topic: (iv) **Technical, Medico-legal, Regulatory and Practical challenges and solutions**

14:15-14:45 **Telemedicine and its application to remote areas**
Dr Ganapathy, Apollo Hospitals, Chennai

14:45-15:15 **Regulatory, compliance, standards unique to India**
Dr Ramachandra, Director, NDRF, Bengaluru

15:15-15:45 Tea Break

15:45-16:15 **Security issues, public safety**
Speaker: Dr MA Saleem, IPS, Govt of Karnataka

16:15-16:45 **Legal aspects of application of Drones for medical emergencies**
Prof. Balakista Reddy, NALSAR, Univ. of Law, Hyderabad

16:45-17:15 **Type of organization needed to take this forward**
Prof. G Raghuram, Director, IIM Bengaluru

17:15-18.15: **Panel Discussion on Topic:**
Moderators: Dr Ramachandra, Dr Vinay Nadkarni

Panelists: Prof Sudhakar, IIT Bombay (retired); Dr Murali Krishna, Rep DGCA ; Prof. Chiranjib Bhattacharjee, IISc ,Bangalore given 5 minutes each to contribute more on topic, followed by 30 min of Q and A for Moderators, Panelists, Participants)

1815-1830: **Dr Kota Harinarayana and Prof C Nataraj: summary & feedback/comments from participants and Instructions for program for Day 3**

Wednesday 07 March 2018: Day 3

07:30-08:45 Breakfast

08:45-09:15 Opening Remarks (Workshop Coordinators: Prof C. Nataraj / Dr Kota Harinarayana) and Goals for the Day

Stated goals for conference:

1) Primary Objective: Clearly define the concept of operation and obtain clarity on the specific R&D on Emergency Medical Delivery system integrating UAVs (EMeDS) that needs to be done with short and long term goals and metrics for success.
2) Secondary objectives:
    a. Form interdisciplinary working groups to follow upon EMeDS platform/process design and development activities in India and connect these efforts with similar groups and entities in USA through future joint collaborations.
    b. Develop a white paper and fully informed proposal that will be submitted to a funding organization.

Topic: Interdisciplinary Working groups finalise the concept of operations and clarify Specific R,D&D for EMeDS with short and long term goals and metrics for success

09:15-10:00 4 Breakout groups (45 minutes in a group)

10:00 -10:45 4 Breakout groups (45 minutes in a group)

10:45-11:15 Tea Break

Topic: Secondary Objectives: Interdisciplinary Working Groups follow up and white paper/proposal for funding development

11:15-12:00 4 Breakout groups (45 minutes in a group)
WG 1, WG 2, WG 3, WG 4

12:00-12:45 4 Breakout groups (45 minutes in a group)
White Paper 1, White Paper 2, Funding proposal 1, Funding proposal 2

12:45-13:30 Breakout group summary, Thank you's from Workshop Coordinators
Feedback and evaluation of workshop

13:30-14:30 Lunch and disperse