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The Japanese Society for Multiphase Flow

Conference Report: The 25th International Congress of Theoretical and Applied Mechanics (ICTAM 2020+1) Aug 20-27, 2021, Online.

by Shu TAKAGI

The 25th International Congress of Theoretical and Applied Mechanics (ICTAM 2020+1) was held as a fully virtual congress from 22 to 27 August, 2021. It was initially scheduled one year before (Aug. 23-28, 2020) and should have taken place in Milano, Italy. But Covid-19 disaster caused a one-year extension, and it was finally decided to transform into the virtual. In spite of online event, it was very successful with 1740 registered participants, 1035 keynote and oral presentations, 388 short oral presentations with posters, 6 mini-symposia, 46 thematic sessions, 16 sectional lectures, 4 plenary lectures, 59 participating countries. The congress was chaired by Prof. Alberto Corigliano, Professor of Politechnico di Milano with the support of Italian Association of Theoretical and Applied Mechanics.

ICTAM is a special conference organized by the IUTAM (International Union of Theoretical and Applied Mechanics). It is one of the oldest conferences in the field of mechanics. It was started with Prof. Theodore von Kármán, professor in Aachen (Germany), who held a conference in Innsbruck in September 1922 to discuss questions of hydrodynamics and aerodynamics. The first IUTAM congress was held in Delft in the Netherlands in 1924. So, the conference is close to its one hundred years anniversary. Starting at 1924, ICTAM has been held every four years. In addition to this ICTAM, there are many satellite symposiums organized by IUTAM, which is called IUTAM symposiums, and you can find the information of upcoming events in the following websites.

https://iutam.org/accueil/upcoming-events/

So, as you can see from the above explanation, ICTAM is like an Olympic of mechanics, where researchers in many different topics of mechanics get

together and have fruitful deep discussion in their contents. Here, I will pick up some of the presentations which are related to our multiphase flow society.

The 25th ICTAM had a Plenary Opening Lecture and a Plenary Closing Lecture. The Opening Lecture was related to solid mechanics (Bioinspired Nanomechanics by Prof. Nicola Maria Pugno, University of Trento). The Closing Lecture is for Fluid Mechanics, (Rheology of Dense Granular Suspension, by Prof. Élisabeth Guazzelli, University of Paris.). The contents are how to model a macroscopic motion of dense granular suspension from microscale modeling of each particle. She explained many different approaches for this problem.

They have 18 keynote lectures assigned in minisymposia. Prof. Howard Stone (Princeton University) gave the keynote lecture with the title of "Particle motion nearby rough surfaces". In this talk, mobility of a spherical particle was described as a function of roughness and surface shape. It was very interesting to see how the randomness of the surfaces appears in the trajectory of the particle. It was emphasized that the feature of surface roughness amplifies the in-plane and perpendicular motions. The analysis can be utilized to understand the behaviors of microswimmers near corrugated walls.

I was also very much impressed by the keynote lecture by Prof. Genta Kawahara (Osaka University). The talk was related to the invariant solution of the turbulent flows. It is the topic for single phase turbulence and the solutions will not be available to multiphase flow turbulence. But the way of thinking to understand complicated non-linear dynamics inspired me a lot. The series of studies have been conducted with the collaboration of Prof. Uhlmann (Karlsruhe Institute of Technology), who is well known for the large-scale simulation of particulate turbulent flows.

By the way, talking about the turbulent flows, Prize Plenary Lecture of the 2020 Batchelor Prize winner in Fluid Mechanics was given by Prof. Alexander J. Smits (Princeton University) with the title of "Measurements in Wall-Bounded Turbulence". He gave the impressive talk about the extremely careful measurement for turbulence. At the end of his talk, he showed interesting cartoon and explained that the computer simulations are getting more and more important. It was just a support to stand up with two legs of experiments and theory. Then, it became an important third legs which is nearly equivalent contributions. Now it has become the muscle to strength the experiment and theory. The Batchelor Prize is thought to be the most distinguished award in the field of Fluid Mechanics. The first winner was Prof. Haward Stone (2008), the second was Prof. Detlef Lohse (2012), the third was Raymond E. Goldstein, and this time is the fourth and was Prof. A. Smits. Both Prof. Stone and Prof. Lohse have great contribution to the field of multiphase flows. Prof. Goldstein has been working on physical aspects of multicellularity, which contains the topic of collective behaviors of microorganisms. Since this topic is also the topic of dispersed multiphase flows, we can say that three among four topics of Bachelor Prize are related to the multiphase flows. Noted that Prof. Lohse was the plenary lecturer of the ICMF-Yokohama, 2004.

Getting back to the talk in ICTAM, I was also very interested in the talk by Dr. Jacques Magnaudet (CNRS, France), who gave the talk about two bubble interactions rising inline. He discussed the different type of motions called DKE (Drafting-Kissing-Tumbling) and ASE (Asymmetric Side Escape)

For Japanese researchers' talks related to the multiphase flows, Prof. Minori Shirota gave the talk with the title of "Thermally-driven bubble oscillation in an impacting drop." They observed a unique circular subcooled boiling in an impacting water drop on a heated solid surface using high speed camera and revealed that evaporation of microlayer and the condensation on the subcooled liquid play important roles for bubbly dynamics. Prof. Masako SugiharaSeki gave the talk with the title of "Inertial focusing of spherical particles suspended in square channel flows." They had found the very interesting characteristics about the stable position of a spherical particles in a cross section of the square channel. To understand the phenomena, they compare the experimental and simulation results in the present talk. There are one oral and two poster papers from the group of Prof. Yoshiyuki Tagawa. All of them are very interesting in the sense that they have simple experiments explained by the simple mathematical model with the important physics sophisticatedly involved. For example, oral presentation was given with the title of "Terminal extensional viscosity of dilute polymer solution using CaBOR-DoS system", which discuss the very thin

liquid thread becoming unstable due to the effect of surface tension and forms a beads-on-a-string and pinch-off.

At last, I would like to mention what was good with the present fully virtual events. The presentation was given in two ways, which is worth for explaining. The plenary and keynote lectures were given with real-time online style. For other regular oral presentations, pre-recorded video was played for 5 minutes. Fig.1 shows the snapshot of the pre-recorded video of my presentation. The speakers were expected to attend the session while the presentation videos were shown. After watching the video, the audience can give the questions to the speaker and they are supposed to answer them. In addition to this presentation, the speakers need to prepare the long version video as supplementally materials, which audience can watch any time they would like to watch. This system works very fine for the audience who would like to know more details of the study, although the speakers spend more time for the preparation of two movies (5 minutes short version and 15 minutes long version). It should be also noted that all the presentations were recorded, and we could watch them repeatedly until the end of December 2021; 4 months after the congress. This is a great benefit of the fully virtual congress.

The next ICTAM will be held in Daegu, South Korea, in 2024. It will be the special event to celebrate the 100 years anniversary of ICTAM. I look forward to seeing many of you there.

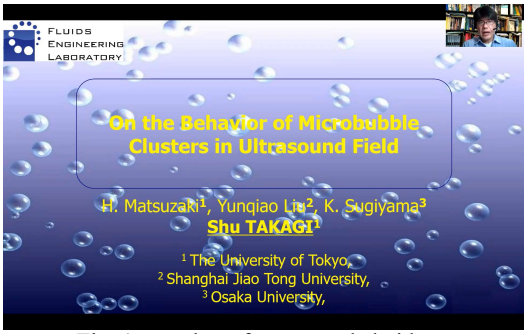

Fig. 1 snapshot of pre-recorded video for my presentation

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Future Meetings

Following list includes conference name, place, date and contact information.

19th Internatinal Meeting on Nuclear Reactor Thremal Hydraulics (NURETH-19)
Brussels, Belgium, March 6 – 11, 2022
Chair: H.A. Abderrahim (SCK, CEN), J-P, Chabard (EDF), X. Sun (University of Michigan)
https://www.ans.org/meetings/view-334/

The 7th International Conference on Jets, Wakes and Separated Flows 2022
Full-Online, March 15 - 17, 2022
Chair: K. Kimura (Nihon University)
http://www.mech.cst.nihon-u.ac.jp/ICJWSF2022/

The 32th International Symposium on Transport Phenomena (ISTP32)
Tianjin, China, March 19-21, 2022
Chair: Y. Utaka (Tianjin University)
https://istp32.scimeeting.cn/en/web/index/

7th Thermal and Fluids Engineering Conference (Hybrid)
Online virtual and in person, Las Vegas, USA, May 16 - 18, 2022
Char: D. W. Pepper (University of Nevada)
http://www.astfe.org/tfec2022/

The 12th Japan-U.S. Seminar on Two-Phase Flow Dynamics
Michigan, USA, May 8 - 11, 2022
Chair: S. Ceccio (University of Michigan)
https://usjapanseminar.engin.umich.edu/

7th Thermal and Fluids Engineering Conference (TFEC 2022)
Las Vegas, NV, United States, May 16-18, 2022
Chair: Darrell W. Pepper (UUniversity of Nevada), Nesrin Ozalp (Purdue University Northwest)
Partially online virtual and in person at University of Nevada
https://www.astfe.org/tfec2022/

13th International Conference on Thermal Engineering: Theory and Applications
Baku, Azerbaijan, May 22 - 24, 2022
Chair: Y. Abdullayev (Baku Engineering University), M.Z. Saghir (Ryerson University)
https://www.ictea.ca/

10th International Conference on Conveying and Handling of Particulate Solids(CHoPS2022)
Salerno, Italy, July 5 - 9, 2022
Chair: M. Poletto and D. Barletta (University of Salerno)
https://www.chops2022.it/

20th International Symposium on Applications of Laser and Imaging Techniques to Fluid Mechanics
Lisbon, Portugal, July 11 - 14, 2022
Organizing Committee: E.Longmire(University of Minnesota), Y. Murai, (Hokkaido University), M. Panão, (University of Coimbra), C. Tropea(Technical University of Darmstadt)
http://www.lisbon-lasersymposium.org/lxlaser2022

Twelfth International Symposium on Turbulence and Shear Flow Phenomena (TSFP12)
Osaka, Japan, July 19-22, 2022
Chair: H.J. Sung, Korea Advanced Institute of Science and Technology (KAIST)
https://www.tsfp12.org/index.html

1st Multiphase Transportation, Conversion & Utilization of Energy
Xi'an, China, July 27 - 31, 2022
Chair: Prof. Liejin Guo (Xi'an Jiaotong University)
http://www.mtcue.org/

The 13th Pacific Symposium on Flow Visualization and Image Processing (PSFVIP13)
Shinjuku, Tokyo, August 7 - 10, 2022
Chair:Yokono Yasuyuki(The Univesity of Tokyo),Someya Satoshi(AIST)
https://psfvip13.org/index.html

29th International Conference on Nuclear Engineering (ICONE 29)

Shenzhen, China, August 8 - 12, 2022
http://icone29.ns.org.cn/

13th International Topical Meeting on Reactor Thermal-Hydraulics, Operation, and Safety (NUTHOS-13)
Taichung, Taiwan, September 4 - 9, 2022
Chair: M. Lee (National Tsing Hua University)
https://www.ans.org/meetings/view-348/

World Congress of Particle Technology
Madrid, Spain, September 18 - 22, 2022
Congress Chair: Carlos Negro (University Complutense of Madrid)
https://wcpt9.org/

12th Japan-Korea Symposium on Nuclear Thermal Hydraulics and Safety (NTHAS12)
Miyazaki, Japan, October 30 - November 2, 2022
General Chairs: Prof. Yutaka Abe (Univ. Tsukuba), Prof. Jae Jun Jeong (PNU)
https://www.nthas12.org/index.html

16th International Conference on Fluid Control, Measurements, and Visualization (FLCOME 2022)
Beijing, China, 2022
Chair: J. Wang (Beihang University)
http://ltlx.buaa.edu.cn/FLUCOME2021/Home.htm

---------- 2023 and beyond, not yet determined ---------

The 11th International Conference on Multiphase Flow (ICMF 2023)
Kobe, Japan, April 2 - 7, 2023
Chair: Y. Murai (Hokkaido University)
http://www.jsmf.gr.jp/icmf2022/

ASME - JSME - KSME Joint Fluids Engineering Conference 2023
Osaka, Japan, June 9 - 13, 2023

26th International Conference on Chemical Thermodynamics (ICCT-2023)
Osaka, Japan, July 30 - August 4, 2023
Chair: K. Saito (Osaka Univ.)
https://www.chem.sci.osaka-u.ac.jp/lab/micro/ICCT2023/pg80.html

The 8th International Conference on Micro and Nano Flows (MNF2023)
London, The United Kingdom, 21-23, August, 2023
Chair: T. G. Karayiannis (Brunel University London)
https://www.micronanoflows.com/mnf2023

European Conference on Thermophysical Properties (ECTP 2023)
Venice, Italy, 2023
Chair: A. Muscio (AIPT / Univ. Modena e Reggio Emilia)
http://www.ectp2020.eu/

Particle growth in turbulence
Stockholm, Sweden, Postponed
Chair: A. Brandenburg (Nordita)
Chair: B. Mehlig (University of Gothenburg)
https://www.nordita.org/events/particles2020/

14th International Symposium on Ultrasonic Doppler Methods for Fluid Mechanics and Fluid Engineering
Kobe, Japan, October, 23-25, 2023
https://www.isud-conference.org/

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