Working Group 7: Cross sectional issue

Theme 1:Ethical, Legal and Social Issues (ELSI)

Chair: Dr. KOTANI Motoko, Sub-Chair: Dr. KOBAYASHI Tadashi

Discussion

We should conduct ELSI activities
-to realize S&T innovation meeting expectation from society,
-to contribute to the reform of research system in Japan.
There have been many ELSI activities in Japan, however most of them are not well organized nor insititutionalized.

Especially, we should make an effort in address ELSI in the MS Program,
because it is a key element for the success of this cutting edge and disruptive innovative program.

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Discussion

We would like to share the followings on ELSI activities
1. are essential components, not obstacles, in conducting research,
2. should be addressed from various viewpoints including legal aspects,
3. should be carried out throughout research,
4. should engage everyone involved in research,
5. should be encouraged and highly appreciated as rsearch,
6. contribute to the quality of research.

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Discussion

We would like to propose the followings for the MS program.

1. To implement ELSI activities through the MS program from proposal solicitation to evaluation.
2. To support researchers, PDs and PMs in working on ELSI
   -by providing opportunities for researchers to learn ELSI,
   -by creating a network of stakeholders and a forum for discussion for each MS goal,
   -by fostering people who do and/or support ELSI activities.
3. To secure resources for above activities.

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Theme 2:Mathematical Science as cross-sectional for MS goals

Chair: Dr. KOTANI Motoko, Sub-Chair: Dr. KOBAYASHI Tadashi

Talks:

"Mathematics in the real world: some recent successes and open challenges "
"Living Theorems in the Society"
"Good Practice at IPAM: The Impact of Mathematics on other Sciences and Society"
"The unreasonable effectiveness of mathematics for the moonshot program"

Panel Discussions:

Mathematical Science as Cross-sectional Technology to Pursue All MS Goals

- What are useful mathematical ideas and methods in the era of digital revolution
- What are cross-sectional technologies on mathematics for MS goals
- How we establish a platform to develop mathematical methods for solution of societal problems to make efficient interaction

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Discussion

- In the *Digital Revolution*: management of big data has arisen as a key challenge. The effective interaction between the real world and the digital world is a core concept to realize *Society 5.0* for sustainable development of human centric society.
- New roles of mathematical sciences are to formulate societal issues into mathematical challenges
- Common mathematical concepts and methods such as big data analysis, machine learning, mathematical modeling, geometry, analysis, algebra, uncertainty quantification, etc. have been used in many successful projects in tackling societal problems.
- There are Mathematical institutes which host long-term(from a few months to one year) thematic programs or series of workshops to incubate ideas to transform societal problems into mathematical concepts, to identify future research directions, and to develop the frontiers of mathematics inspired by inviting researchers related by themes set across disciplines from all around the world. They also function as hubs of international collaboration and by fostering young researchers.

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Recommendations:

We identify mathematical technologies expected to be useful to accomplish MS goal. Many common ones exist across throughout WGs. Our recommendations are:

i. Set a cross-session team on mathematical science to collaborate with MS program teams. Its mission is to discuss useful mathematical methods and researchers who can provide ideas to apply and possible solutions to specific problems in MS goals related to mathematics.

ii. Arrange a platform to gather researchers from around the world to discuss and identify directions to move forward and to identify proper methods of mathematization of the societal problems and challenges in the MS goals that emerge during the course of proceeding with programs on the MS goals.

iii. International collaboration and participation while fostering young people (including students) should be included

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Conclusion

- **In the Moonshot R&D program, a new management system should be introduced.**
  - To create human-centric society with a clear vision, harmony between STI and ELSI is important
  - To maximize its achievement not only of each project nor each goals but of a whole package, development of methodology to share knowledge and results across projects, goals is important. Mathematical science, including data science, computational science and AI, provides such a framework in the era of digitalized society.
- **Fostering researchers with challenging mind, broad view points to form our future is to be regarded as a big achievement**

- **Cross-sectional teams to support the whole Moonshot R&D program can contribute to such system**
  - Dialogue between MS Projects & Cross-sectional teams are the most important
  - To find solutions or directions for new challenge emerging in proceeding research in each projects, platforms to discuss them by gather multi-disciplinary researchers from all around the world are needed.