

Science and Engineering Research Board

SERB-INAE Online and Digital Gaming Research Initiative

Advances in digital services, virtual technologies and the anvil of 5G and 6G services, will usher online gaming tools for education, entertainment and utility purposes. In addition to their societal and economic values, it is clearly evident that games and simulations are exciting problems for research and translation, leading to commercial potential. Focused studies with online and digital gaming tools could be applied to board and video games, puzzles, ability enhancement games, and online content that will aid development of digital games centered on ethos and values. The latter is quite useful for horizontal diffusion of digital and online gaming tools in S&T disciplines along with contribution to social sciences such as sociology, psychology, values and ethos.

Given the strength of Indian R&D community in software development, computer visualization, human-computer interface, we are suitably poised to take online and digital games for education, learning, entertainment, Indian culture, and arts. The advantage of multi-player online games and digital technologies will eventually also reinforce our commitment for social diversity and community inclusion. It is notable that digital online games bring in more revenue compared to other entertainment industries, and are well integrated, especially with the younger population, as a part of contemporary culture. With faster internet connectivity (5G) and advances in mobile technology platforms, newer forms digital gaming, virtual and augmented reality games, animation, and comics necessitate indigenous breakthrough and development to also reflect Indian ethos and values. In addition, newer developments in cloud gaming would leverage and exploit hyper-scale cloud capabilities, global delivery networks, and powerful streaming media to usher futuristic social entertainment platforms with a strong presence in the global market.

Considering the above-mentioned aspects and potential of the emerging field of gaming, in association with the **Indian National Academy of Engineering (INAE)** as a knowledge partner, SERB announces ***“SERB-INAE Online and Digital Gaming Research Initiative”***. Under this initiative, well-defined proposals on the following thematic areas concerning online and digital games are being invited:

Category (I): R&D in Learning, Educational, and Leisure Online Gaming Platforms

Development of game-based interactive tools that offer and enhance creative insights for a focused application by improving the design, user interface and interactive experience. Gaming modules and computer simulations need to be developed as instructional toolkits for collaborative anytime learning, with due challenges that encompass the whole spectrum of end users from school children to adults.

Category (II): Immersive Game Prototypes, with a focus on Indian Culture & Values

Indigenous gaming research should aim to reflect Indian ethos and values while making newer digital games appealing and useful for a wide spectrum of end-users at both national and global levels. The design and development of Games are expected to be focused on learning, education, social awareness and skilling. It should be possible to merge artificial intelligence, virtual and augmented reality, India-centric narratives, and advanced computer graphic interfaces, to name a few. There will be efforts to place India's indigenous games could be popularized in the digital space.

Category (III): Collaborative Technical Design Process: Creation of SERB Game Labs

This area of research provides an opportunity for cooperation between academia, start-ups, and industry by creating playable, real-world demonstrations of state-of-the-art concepts and research. This call endeavours to create **SERB Gaming Labs** in institutions where collaborations would germinate between academic researchers and industries so that true translation could occur.

Nature of Proposals to be Supported:

The proposals in digital games – conceptualization, designing, development, AI engine, assets library, game player behaviour and game studies are being invited. The emphasis should be on India-specific themes and contexts. The applications range could be learning, education, and leisure within the ambit of Gaming.

a. R&D should be focused on any one or more following areas of digital gaming

- i. Games for Education, Learning, Social Awareness
- ii. Games for Therapeutics (Physical and Psychological ailments)
- iii. Games for Leisure and Recreation

b. Broad Topics of R&D Effort

- i. Novel Methodologies for Application Directed Game Design e.g., how to design games as therapeutic tools?
- ii. Psychology of Gaming – How can games be conscientious and not addictive?
- iii. Evaluation and Testing Methodologies for Games
- iv. Software Engineering for Game Engines

c. Technology Challenges for Development of Games based on Indian Ethos (indicative)

1. How to generate context-specific software assets for the realisation of appropriate gaming environments – chosen from Indian Mythology, History, Geography and Culture

1.1 Modelling Mythological Characters

1.2 Draping of Indian Clothes

1.3 Modelling of Games based on Indian Performing arts and appropriate animation models

- 1.4 Assets based on heritage sites
2. Technology know how to represent and use different facets of Indian tangible, intangible and ecological heritage in the digital space as gaming assets
3. AI tools for procedural content generation (texture, terrain, vegetation, buildings, storyboards) with reference to the regional contexts of India
4. Deep Learning & Reinforcement Learning-based advancements for the behavioural logic and patterns of Non-Playable Characters (NPCs) to make them behave more life-like
5. Generation of Creative Game Concepts immersed in Indian regional culture
6. Development of Augmented/Mixed Reality games for exploiting cultural traditions and assets of India
7. Exploring ways to exploit Web 3.0 and Metaverse for gaming with Indian cultural assets
8. Sound
 - 8.1 Ambisonic Sound Design
 - 8.2 Package creation of Indic sounds (Environment, Ambient)
 - 8.3 Package creation of sounds of Indic Musical Instruments (ancient and modern)
9. Multi-Sensory Experience
 - 9.2 Device-research and Haptic integration for PC/Console/VR
 - 9.2 Device-research and Olfactory integration for PC/Console/VR
 - 9.3 Device-research and Gustatory integration for PC/Console/VR

d. Testing the Infrastructure for hosting & hardware

- i. Cloud gaming
- ii. Mobile bandwidth and MMOGs
- iii. Publishing

e. SERB Gaming Labs:

- i. Proposal on Gaming labs may be submitted to establish infrastructure and enabling facilities for promoting R&D activities in emerging areas of Digital gaming, ideally by partnering with institutions of high learning and industry.
- ii. The core research of these labs should be identifying and providing solutions to the important challenges faced by the Digital Gaming community.
- iii. These labs may also act as teaching/ training/ mentoring hubs for the Digital Gaming research community, particularly the students in game research and development.
- iv. The support under “Gaming Labs” may include the upgradation/ modernization of existing R&D facilities (no fresh constructions) in Gaming, acquisition of essential equipment within the ambit of Gaming, setup of gaming studios, etc.

Who can apply?

- Scientists in regular service from educational and research institutes/ laboratories/ universities, start-ups and industries. More than one academic partner may be allowed.

- Proposals ideally form a consortium and should be an industry-academy (including start-ups) collaboration with IP creation as a priority.
- Investigators already having a SERB project are also welcome to apply.
- It is desirable that teams be multidisciplinary involving technologists, designers, historians and experts in other areas of humanities and social sciences.
- More than one Industry and/or more than one Investigator can be associated in a project.

Nature and Duration of Support:

- The typical duration of a project will be of two years with a possibility of an extension for one more year (based on progress). However, it may be of 3 years duration (extendable to 2 more years based on progress) for Gaming Labs.
- The funding will be provided for **(i) essential equipment, consumables, travel, contingency** (for certain elements related to gaming) and **(ii) manpower**. "Overheads" will also be provided to the implementing institution as per prevailing norms of SERB.
- The consumable and contingency may be used for license/registration fees for gaming software platforms (the software platforms could be used on sharing basis with start-ups as well as license fees may also be shared), app/web certification (such as security, VPN, copywriting etc.) and play stores etc.
- Foreign travel is not permitted under this initiative.
- The technical/scientific manpower may be proposed for the project as per SERB notification SB/S9/Z-06/2019 dated 23-04-2019 and SB/S9/Z-07/2020 dated 25-08-2020. The associated manpower should not be linked to any degree program and it is expected that they should be provided mobility flexibility for field/industry visits. Details of human resources (students, engineers, technicians, fine artists etc.) support and sharing (laboratory/academia + startup) may be explicitly defined.
- All the rights, duties and obligations pertaining to any intellectual property, profit sharing/royalty and/or related aspects shall be discussed and agreed upon separately in writing at a later stage of the project (if supported).
- The component of the grant will be similar to Core Research Grant (CRG) projects supported by SERB.

Eligibility Criteria:

1. Applicants [Principal Investigator (PI) and / or Co-Principal Investigator(s) (Co-PI(s))] should be Indian citizens. Foreign nationals (including OCI and NRI) are also eligible to apply provided they fulfil the eligibility criteria notified by SERB (SERB Funding Guidelines for foreign nationals dated 27th Oct 2016) and The Gazette of India Notification of Ministry of Home Affairs vide. S.O. 1050(E) dated 4th March 2021 in respect of OCIs.
2. The applicant(s) **from academia** must hold a regular academic/research position in a recognized academic institution or national laboratory or in any other recognized R & D institution in India with at least 3 years of service remaining. The term "Regular" refers to the applicants who are

appointed against the sanctioned post or in a tenure post but are likely to be renewed after the end of the tenure.

3. Private Academic institutions with valid UGC / AICTE / PCI approval, Private R&D Institutions with valid DSIR-SIRO recognition and Voluntary and Non- Governmental Organizations registered under NITI-AAAYOG Darpan portal are eligible to host a project.
4. The PI and Co-Investigator(s) **from academia** should hold Ph.D. degree at the time of applying for the grant.
5. Faculties recruited through UGC-Faculty Recharge Program are eligible to apply. INSPIRE Faculty, Ramanujan and Ramalingaswamy Fellows are also eligible to apply provided they have sufficient tenure remaining at the time of submission of application.
6. Investigators who will be superannuating during the duration of the project or already superannuated are also eligible to apply. In such cases, a Faculty/Scientist from the host institute who has at least 5 years of service remaining should be associated as a Co-PI. The host institution should allow the investigator to continue after superannuation and provide the required support towards implementation of the project.

Other Guidelines:

1. The scientists/ investigators from industries should align with investigators from academic / research institutions as co-investigators.
2. The participating industry/ start-up will collaborate with the Principal Investigators and/or the research team of the Individual Projects in leveraging the strategic and technical expertise of the industry in carrying out the research activities and achieve the milestones.
3. All the rights, duties and obligations pertaining to any intellectual property, profit sharing/royalty and related aspects shall be discussed and agreed separately with the participating Academic Institutes and Industry in the Individual Agreements. A copy of the agreement should be shared with SERB at the time of initiation of the project.
4. The investigators shall ensure that any submission made by them does not violate any of their or any third party's IPR, confidentiality or any statutory provisions. Under no circumstances, SERB & INAE be held responsible or liable in any way for claims and discrepancies or disagreements of any kind.
5. SERB-appointed committee reserves the right to decide eligibility as per established guidelines.

Evaluation Criteria:

The review and selection of proposals will be carried out through a Program Management Advisory Committee (PMAC) constituted for the purpose. Broadly, the review will be conducted in 2 phases:

Phase 1: The PMAC will review all proposals and down-select top-quality proposals for each problem definition. Committee may ask for more inputs from Principal Investigators ("PI") of the Participants, if needed.

Phase 2: The shortlisted PIs will be invited to make a presentation on their proposal to the PMAC. Based on this, the PMAC will recommend the winning proposal.

Plagiarism:

Proposals submitted must be original in ideation and content. Plagiarism in any form will not be acceptable. All submitted proposals would be subjected to a third-party similarity check and proposals are liable to be rejected if found plagiarised. Any text taken verbatim from other sources needs to be identified using quotation marks and proper reference. Applicants are requested to pre-check their proposals for plagiarism before uploading. Proposals found containing plagiarised content will be rejected.

Selection and Mode of Application:

- An applicant is eligible to apply for only one proposal.
- The proposal should be submitted to **INAE** in the prescribed format along with all supporting documents as given below:
 - a. Biodata/CV
 - b. Certificate from Principal Investigator
 - c. Endorsement Letter from the Head of Institution
 - d. If the project is approved for funding support, the Quotations of the approved equipment need to be uploaded within one month of the date of the Approval Letter.
 - e. Plagiarism undertaking Download Template
- The Call for applications will be notified through the SERB and INAE websites.
- The selection will be based on the recommendations of PMAC constituted by the Board.

Contact person:

From INAE:	From SERB:
Deputy Executive Director, Indian National Academy of Engineering (INAE) Ground Floor, Block-II, Technology Bhavan, New Mehrauli Road, New Delhi-110016 Email: inaehq@inae.in Phone: 011-26582475 Website: www.inae.in	Member Secretary, Science and Engineering Research Board (SERB) 3rd & 4th Floor, Block II, Technology Bhavan, New Mehrauli Road, New Delhi-110016 Email: communications@serb.gov.in
