



## COMPETITION GUIDELINES 3.0

August 30, 2019

The ANA Avatar XPRIZE ('Avatar XPRIZE' or 'AAXP' or 'Competition' or 'Prize') is governed by these Competition Guidelines. Please send any questions or communications about them to [avatar@xprize.org](mailto:avatar@xprize.org). XPRIZE may revise these Guidelines at any time during the course of the Competition to provide additional information or to improve the quality of the Competition. Unanticipated issues may also arise that will require modifications to these Guidelines. XPRIZE reserves the right to revise these Guidelines as it, in its sole discretion, deems necessary or desirable. All registered teams will be notified of any revisions in a timely manner.

Further details concerning the operation of the Competition, such as exact dates and locations of events, specific technical thresholds for performance testing, and other operational information will be published in Rules and Regulations and other documents throughout the course of the Competition. Rules & Regulations will be developed by XPRIZE in consultation with the Advisory Board and Judging Panel and will be provided to all registered teams well in advance of the events they govern.

These revised guidelines were developed based on public feedback from the original launch guidelines, along with extensive consultations with domain experts through surveys and meetings, discussions with the ANA Avatar XPRIZE team and input from the title prize sponsor, All Nippon Airways (ANA).

**NOTE: Items in bold are defined in Section 9: Glossary.**

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## 1. COMPETITION OVERVIEW

The \$10M ANA Avatar XPRIZE is a four-year global Competition focused on the development of an **Avatar System** that will transport a human's sense, actions, and **presence** to a remote location in real time, leading to a more connected world. For the purposes of this Competition, an Avatar System is defined as a physical **Robotic Avatar** operated by a person (**Operator**) and interacting with an environment or a person at a distance (**Recipient**).

The ANA Avatar XPRIZE seeks to incentivize innovators around the world to imagine a future with Avatars and integrate emerging and exponential technologies to create a useful and functional physical Robotic Avatar System. Current investment and research tend to focus on the development and incremental improvements of individual component technologies, rather than bringing together synergistic technologies to support transformational leaps. A successful solution to this challenge will enable humankind to take the next step in transcending the limits of physical transportation, leading to a more connected world.

Robotic technologies have advanced greatly in the last decade, but challenges remain for them to become more useful for everyday human needs and activities. Human-touch interface technologies, or **Haptics**, are advancing rapidly, and need more development to find their role as critical components of an advanced Avatar System. New sensors being developed can give robots enhanced capabilities and more elegant solutions for conveying information. Virtual Reality (VR) and Augmented Reality (AR) advancements are enabling more immersive user experiences; however, those experiences have limited interaction with the physical world. AI has a role to play in the future Avatar System too, in its predictive capabilities, or for data acquisition, learning and understanding. And **Brain-Machine Interfaces (BMIs)** can give extremely nuanced capabilities to the operators of future Avatar Systems. By combining these technologies in unique, novel and integrative ways, we see a vision of the future unfolding. Any human could be enabled to connect instantly around the globe, circumventing lengthy time constraints, to be with other human beings, fulfilling a need at a remote destination, or bringing expertise to those in need.

For example, in the near future, physical Avatars could help provide critical care and deploy immediate emergency response in natural disaster scenarios, stretching the boundaries of what is possible, maximizing as well as enhancing the impact of an expert's skills. In health-related arenas, Avatars could radically transform today's health care providers into a globally distributed, decentralized system of wellness. In learning environments, one expert teacher could bring knowledge to thousands of eager learners at several remote locations at the same time. Avatars could expedite the maintenance of housing, farms, and food production domains. In personal relationships, Avatars will bring people closer together, despite their age, location or mobility.

Imagine a future full of Avatars, connecting people and enabling a more prosperous and abundant world.

## 1.1 Team Goals and Composition

**The winning team will integrate multiple emerging technologies to develop a physical, non-autonomous Avatar System with which an operator can see, hear, and interact within a remote environment in a manner that feels as if they are truly there.**

Such an Avatar System will enable a person to connect to others or to accomplish a need at a remote location, and actually feel that they are present at that location. This sense of presence in a physical embodied Avatar form is a key principle by which the overall success of the winning Avatar System will be evaluated.

Teams are encouraged to collaborate and share skills. **Interested teams** can utilize the Competition portal **POP** ([pop.xprize.org](http://pop.xprize.org)) to meet other teams and evaluate possible collaboration opportunities. Team members are not required to all be at a single location, and there is no specific requirement for the number of team members.

## 1.2 Avatar Technologies

A successful Avatar System will require the skillful integration of multiple technologies, many of which are just emerging.

Areas of technology integration may include, but are not limited to:

1. Robotics
2. Perceptual Systems
  - a. Vision/Computer Vision
  - b. Auditory Processing
  - c. Smell and Taste
  - d. Haptics
  - e. This term includes sensory subsystems derived from the involvement of the skin, muscles, and joints. For the purposes of this Competition it may include tasks that require:
    - i. Determining structural and substantive attributes of objects
    - ii. Categorization of objects into previously identified classes
    - iii. Interactions of the Avatar parts with recipients
    - iv. Transmission of haptic sensations from the Avatar to the operator

3. Virtual Reality (VR) Immersion Techniques
4. An **Operator Interface** that provides connection between the Operator and the Avatar
5. **Brain Machine Interfaces (BMI)** Included in this term are sensors that can measure various types of brain signals such as electroencephalograms (EEG). For the purposes of this Competition these must be externally worn and not be invasive
6. **Wearables** Included in this term are advanced sensors as well as body sensors like EMG, Skin Conductance and EKG. Such technologies can be used for semi-autonomous control (where appropriate), or possibly for embedded self-assessment of how the Human-Avatar System is performing
7. **Simultaneous Localization and Mapping (SLAM):** Environmental awareness
8. Extrasensory Imaging and Perceptions (infrared vision, ultrasonic hearing, etc.)
9. Artificial Intelligence (AI)
10. High speed network connections and latency reduction

### 1.3 Avatar Form and Modes

There is no prescribed form that the Robotic Avatar must take, though weight and height restrictions may apply and will be specified in the Rules and Regulations. Teams should take into consideration the human-centered environments when designing their Avatars. Teams are free to design their own, purchase or license a commercial solution, or modify an existing robot form. Technology partnerships and licensing agreements for various components of a team's solution are permitted and encouraged. Entries will not be judged on the appearance of the Avatar. While there is no requirement for it to have a particularly humanoid appearance, the goal of creating human to human or human to needs-based solutions may require elements of a humanoid form that are recognizable and understandable to the person interacting with the Avatar.

For the purpose of this XPRIZE, Robotic Avatars may incorporate three primary modes. These are the accepted modes an Avatar can work within and may be reflected in the actual **Testing Scenarios**. Scenarios will not be focused on these modes separately, but any testing scenario may include aspects of these defined modes. **Avatars that are entirely or primarily autonomous will not be considered in this Competition.**

**Mode 1. Operator Control Mode:** Avatars serve primarily as remote agency mechanisms for the Operator. In this mode the Robotic Avatar only does what the Operator does, perhaps with some predictive AI to deal with network issues or environment recognition. The goal of this mode is to connect the human operator with another human or humans at a distance in such a way that the Operator feels themselves to be interacting with others as if they were truly in the remote location.

**Mode 2. Enhanced Avatar Mode:** In this mode, the Avatar provides enhanced capabilities to the Operator, such special skills like seeing in infrared, and/or being able to map out and analyze an environment, or utilizing the muscle memory of experts that have trained it. Enhanced capabilities are especially important for Avatars that are involved in activities such as disaster relief where such extra capabilities can help ensure the success of the operation. This Avatar is still primarily under the Operator's control.

**Mode 3. Semi-Autonomous Mode:** The Avatar takes input such as goals from the Operator, processes that input for understanding and then executes details based on that understanding, still under primary Operator control. In this mode, while taking input from the Operator, the Avatar may also be able to modify its actions based on interactions with Recipients. Also, in this mode the Avatar can have responses that may not be fully dictated by the Operator, such as balance recovery, or mitigating security situations.

### 1.4 Testing Scenarios

Each **Testing Scenario** will comprise a series of tasks designed to cover a broad range of activities within a **domain**. Some examples of tasks are provided below and are indicative of those that could be used within the Testing Scenarios during the Semifinals and Finals events. Any Testing Scenario may incorporate all three modes of the Avatar described above.

The following are *examples* of discrete tasks that could be part of a Testing Scenario and are for illustration only *as tasks will change, be refined, subtracted or added as the Competition progresses*. Actual Testing Scenarios will be provided in forthcoming releases of the Rules & Regulations.

- The Operator, through the Avatar, selects a ball of a color specified by the Recipient and throws it to the Recipient.
- The Operator, through the Avatar, asks the Recipient to give the Avatar a specific bottle of medication. The Operator must confirm that it is the right one.
- The Operator, through the Avatar, greets the Recipient at the remote location by offering a handshake. The Operator must physically feel the handshake.
- The Operator, through the Avatar, takes a battery or charging device from the recipient and plugs it into an outlet or power strip.
- The Operator, through the Avatar, plays a simple board game like checkers with the Recipient.
- The Operator, via the Avatar, gives the Recipient a gentle hug. The Operator can feel some aspect of the hug returned by the Recipient.

- The Operator, via the Avatar, reads a paper shown to them by the Recipient that describes the health status of a patient and a list of tasks to do in the health care assessment.
- The Recipient tells the other person where they had a minor injury by touching that part of the Avatar. The Operator must respond in a way that shows they know exactly where the Avatar was touched because the sensation has been conveyed from the Avatar to the Operator.
- The Avatar holds a cube that weighs between .5 and 3 kg in its hand. The Operator feels the weight and can guess the weight of the cube.
- The Avatar is blind folded and given an odd shaped object and through touch alone must convey enough haptic information back to the Operator so they can guess what that object might be.
- The Avatar conveys the location of a surrogate for a live person or animal buried under rubble by assessing the environment for heat signatures.
- The Avatar uses its extrasensory abilities (such as noting vibrations or smells or ultrasonic hearing) to assess the danger in a particular location and conveys that information, along with the perceived level of threat to the Operator.
- The Avatar conveys general sensor information about the environment to the Operator via an easily readable Heads-up Display
- The Avatar reports on how many other humans are currently in its environment.
- The Recipient responds in ways that indicate they were able to effectively understand the Operator's interactions (voice, gestures, movement, etc.).
- The Recipient reports that they felt as if they were in the room with another person (the Operator)?
- The Recipient is able to interact physically with the Avatar in a limited range of tasks (such as a handshake).
- The Recipient reports that they felt safe in the presence of the Avatar.
- The Avatar takes a command from the Operator to measure the perimeter, ingress and egress points of its environment and does so, producing a graphic map with the distances and openings clearly marked which is sent back to the Operator.
- The Avatar continues to perform a given command such as taking a box off the shelf, or opening a door, while experiencing a network outage.
- The Avatar continually scans sensors in its environment and sends that data back to the Operator via an easily readable Heads-up Display. Areas of concern are designated by some means of attentional focus, such as a blinking color.
- The Avatar recovers from an unexpected glitch in balance, latency, or power.



- The Avatar requests a spoken command to be repeated when it fails to hear correctly, such as in a noisy room.

Scoring criteria for any Testing Scenarios will be detailed in the Rules and Regulations.

## 2. COMPETITION STRUCTURE AND REQUIREMENTS

### 2.1 Launch

The Competition was launched on March 12, 2018.

### 2.2 Release of Revised Guidelines

These current guidelines are a revision of those published at Launch, and incorporate feedback from the public, a select group of technical experts, and other stakeholders. The Revised Guidelines (V 2.0) were published on September 10, 2018 with additional updates for Guidelines (V 3.0) published on August 30, 2019.

### 2.3 Registration

To register, each team must visit [pop.xprize.org](http://pop.xprize.org), create an online profile, and complete all online application materials. This process can be started at any time after registration opens. Teams must also pay a non-refundable registration fee before the registration deadline. Registration will be open from September 10, 2018 until 18:59:59 UTC September 30, 2019. Teams that register on or before 18:59:59 UTC on January 31, 2019 (**Early Registration**) will be required to pay a registration fee of \$1,000 USD. Teams that register after that date and time and up until 18:59:59 UTC on Sept 30, 2019 (**Final Registration**) will be required to pay a registration fee of \$1,500 USD.

Teams who complete the registration process will be deemed **Registered Teams**.

**Note:** Teams who have registered on or before January 31, 2019 (Early registrants) will be invited to an optional Team Summit tentatively scheduled to be held between April and June 2019.

XPRIZE has sole discretion to register and qualify additional teams from the close of registration on September 30, 2019 to the end of the **Semifinalist Verification** currently scheduled for March 2021. Teams that register during this period must meet all the initial qualification requirements, be approved by the Judges, and pay a late registration fee of \$3,000 USD. This is a limited opportunity and potential teams should contact XPRIZE directly for more details.

## 2.4 Qualifying Submission

The **Qualifying Submission** is a formal plan that outlines and shows proof of the team's capabilities and their progress towards developing a unique Avatar System that meets the Competition goals.

All Registered Teams will be required to complete and submit specific materials for the Qualifying Submission. All teams must provide complete submissions by 18:59:59 UTC on October 31, 2019 in order for the Judging Panel to assess and select teams as **Qualified Teams**.

Up to 150 Qualified Teams will be announced by Q1 2020.

The specific requirements for the Qualifying Submission will be released to teams after the close of early registration, but will include at a minimum technical documentation comprising:

1. Details of team, including current and needed expertise
2. Team objectives for the ANA Avatar XPRIZE
3. Initial design concept
4. Technical feasibility assessment, including
  - a) Robot implementation (morphology, and whether it is bought, modified, licensed or self-made)
  - b) Controller and operating system
  - c) Types of sensory systems the team plans to use
    - o Vision
    - o Hearing/Sound
    - o Haptics
    - o Smell
    - o Other senses
  - d) Plans for use of AI technology: How AI will be used and rationale for choice
  - e) Plans for use of BMI or other sensor technology: How BMI will be used and rationale for choice
5. Plan and timeline for technology development and integration during the Competition
6. Plan and timeline for further development after the Competition
7. Video and/or other media documentation that indicates the team has the relevant capabilities

8. A 2-page Executive Summary of the above information, along with up to 2 pages of images, figures or charts.

## 2.5 Semifinals

Up to 75 teams will be selected to advance to the **Semifinals** where they will be required to demonstrate their system's capabilities under conditions representing the realistic application of an Avatar. Semifinals will be held in specific testing location(s) that will be determined by XPRIZE well in advance of the Competition dates. Following the Semifinals, after the Judging Panel has deliberated, the top teams (up to 20) will advance to the Finals. These Finalists Teams will equally share a \$2,000,000 (USD) Prize.

## 2.6 Finals

Up to 20 teams chosen by the Judges from the Semifinals will compete in the **Finals**. During the Finals, Finalist Teams (**Finalists**) will demonstrate their Avatar across a number of Testing Scenarios.

For each of these Testing Scenarios, teams will be required to demonstrate their system's capabilities under conditions representing the realistic application of an Avatar. The Judging Panel, in its sole discretion, will evaluate competing teams after the close of the Finals, and determine the Grand Prize winner. Specific Testing Scenarios, evaluation metrics and criteria for the Finals will be detailed in the Rules & Regulations.

# 3. JUDGING CRITERIA AND SCORING

## 3.1 Qualifying Submission

Following the submission deadline, the Judging Panel will discuss and evaluate the Qualifying Submission materials to determine which teams will move forward in the Competition. All submissions will undergo an initial review and any teams that have not provided a complete submission will be eliminated from the Competition. This initial review will be followed by a thorough review process of all submitted materials by members of the Judging Panel. The Judging Panel may ask follow-up questions for teams to provide clarification on their submissions. The Judging Panel will determine criteria and weighting for evaluating team Qualifying Submissions.

**Note:** Team requests for scoring feedback will not be considered nor should teams expect feedback from the Judges in any evaluation or testing rounds.

## 3.2 Semifinals

### 3.2.1 Judging Criteria

The Judging Criteria for Semifinals will consider the integration of current state-of-the-art and emerging technologies to enable Robotic Avatar capabilities that allow for the experience of human senses and actions to be transported from an Operator to a remote location in real-time.

Testing Scenarios will be defined to validate the capabilities of the Avatar System. During the Semifinals, Judges will evaluate teams on the capabilities their Avatar displays while performing these Testing Scenarios, and how well the Avatar solution meets the goals of the Competition.

Capabilities within Testing Scenarios may include perceptual skills such as vision, sound, and haptics being conveyed to the Operator through the Avatar, as well as **mobility**, endurance, transmission of enhanced capabilities, the ability to deal with latency issues, and more. Teams are required to demonstrate a unique Avatar System; however, individual technology components may be purchased, licensed, modified, or custom-built to integrate into their solution.

Avatar Systems will not be judged on appearance, but rather the Avatar's capabilities and how well it performs the required tasks, as well as the quality of feedback it provides back to the Operator.

Submission requirements and evaluation criteria will be determined with experts in the core technologies and will be detailed in various releases of the Rules and Regulations ahead of each Competition round.

### 3.2.2 Testing Scenarios

A Testing Scenario consists of a series of tasks (such as illustrated in section 1.3) in a particular domain. Testing Scenario domains will be drawn from these areas such as health care, family connectivity, maintenance tasks, disaster relief, learning and exploration.

Actual Testing Scenario tasks will be defined throughout the Competition, as they must reflect challenges the marketplace has not yet solved. Complete specifications for the Testing Scenarios will be published in an **Operations Guide** in advance of Semifinals Testing.

## 3.3 Finals

### 3.3.1 Judging Criteria

The Judging Criteria for the Finals will be similar to those used during Semifinals, taking into account any advancements in technology that may have occurred during the time between the two events. Final scoring mechanisms will be determined with experts in the various technologies and will be detailed in the Rules and Regulations. The Judging Panel may request

additional information or data from the team during the deliberation process and has the sole responsibility for the final determination of the Grand Prize Winner.

XPRIZE will announce the winning team within a reasonable amount of time following the Finals Competition.

### 3.3.2 Testing Scenarios

Actual Testing Scenario tasks will be defined throughout the Competition, as they must reflect challenges the marketplace has not yet solved. Complete specifications for the Testing Scenarios will be published in an Operations Guide in advance of Finals Testing. XPRIZE reserves the right to adjust the Rules and Regulations to ensure teams are meeting the highest standards of contemporary technology.

## 4. TESTING

### 4.1 Testing Sites

XPRIZE will arrange testing at specific physical location(s) to be determined. These locations will be announced well in advance of the testing dates. Each team will be responsible for their own travel and for any costs associated with the transportation of their system. Teams will be required to attend mandatory rehearsal period, as well as their scheduled testing day(s).

### 4.2 Testing Environment and Power

For all testing, we expect the Operator set up to be in one room, and the Avatar itself, along with Recipient(s) and/or an Environment to be in another. All Avatar testing will occur in a controlled test environment(s) with typical indoor temperature and humidity. XPRIZE will provide sufficient space for each team's Operator and Avatar equipment. AC power will be available for charging and operation through the testing days and times.

### 4.3 Networking

For the Semifinals, testing will simulate high-quality network over a predetermined distance. Networking facilities will be provided via a private network connection implemented by XPRIZE. During testing, this will be the only network permitted for use. Teams will not be able to run other access points or utilize outside networks such as through their own cell phones, satellite link ups or personal routers. Reliability, bandwidth, latency, and jitter will be representative of the best public Internet service available at the time of testing. Testing for the Finals may be simulated or may involve a physical separation, at the discretion of the Judging Panel and XPRIZE. Teams will be informed of the simulated or physical separation option well in advance of the Finals.

## 4.4 Safety

Safety is a top priority for this Competition.

Teams are required to ensure protections for safety with all aspects of their equipment. Safety includes not only reduction of risk of physical injury but also property damage to anything within a testing facility. While it is expected that some equipment will be in an experimental or prototype form, all due precautions must be taken to ensure the safety of all personnel and property in and around such equipment at the testing locations.

Each team should designate a team member as a Safety Officer who will monitor all safety concerns. Teams are required to list all possible risk factors associated with their equipment and enumerate reasonable measures they have incorporated in their system to handle such risks. This document will be delivered to the judges and XPRIZE team before the start of any Competition testing activities.

These risks can include, but are not limited to: electrical hazards, general property damage, thermal issues, pressure problems, chemical contamination or spills, risks due to optics, audio signals, lasers, sensors, actuators, cables, and concerns if the robot loses balance or control. The Robotic Avatar System should have an immediate stop mechanism as part of all operating protocols. All safety procedures must be conveyed in detail to the XPRIZE staff and judges during the rehearsal period.

All reasonable efforts should be made to maximize safety and minimize and potential hazards.

Documentation of safety and physical testing of safety of systems will be complete prior to any rehearsal or testing event. Furthermore, XPRIZE reserves the right to discontinue testing at any time for any actual or possible hazard or perceived safety violation by a Team under guidance from the judges or associated personnel.

Reasonable clothing and safety equipment will be required of all persons at the testing site(s). These may include safety glasses, hearing protection, closed-toed shoes with tread, and no loose clothing or hanging elements such as scarves or jewelry.

For other security concerns security guards will be supplied on testing site premises as required.

## 5. PRIZE PURSES

There will be \$10,000,000 (USD) in total **Prize Purses** available.

## 5.1 Semifinals Prize Purse

There will be a Semifinals Prize Purse of \$2,000,000 (Two Million USD) to be shared equally among all Teams (up to 20) selected as Finalists.

## 5.2 Finals Prize Purse

There will be a Finals Prize Purse in the amount of \$8,000,000 (Eight Million USD). The Finals Prize Purse will be divided among the top ranking Teams as First, Second, and Third Place Awards.

- First Place: \$5,000,000 (Five Million USD)
- Second Place: \$2,000,000 (Two Million USD)
- Third Place: \$1,000,000 (One Million USD)

The \$8 Million (USD) Finals Prize Purse will be awarded to the winning teams of the Competition following the Finals, at an event to be scheduled (tentatively) in early 2022.

# 6. ADDITIONAL TEAM ACTIVITIES

## 6.1 Team Summits

Teams will be invited to participate in a number of **Team Summits** conducted during the Competition. Team Summits will be an opportunity for teams to meet with XPRIZE, interact and collaborate with other teams, and potentially industry, academic, government, media, and other stakeholders as well as potential investors and partners. XPRIZE will share key Competition information at the Team Summits. The Team Summits are tentatively planned for the following periods:

- Team Summit #1: Following Early Registration, the first Team Summit was held in Geneva, Switzerland on May 28-29, 2019.
- Qualified Team Summit: Following the announcement of the Qualified teams in early 2020
- Semifinalist Team Summit: Following the announcement of **Semifinalist Teams** in early 2021
- Finalist Team Summit: Following the announcement of Finalist teams in June 2021

Team Summit times and locations will be determined by XPRIZE. The specific dates and locations will be announced well in advance of each event. Teams will not be required to bring their Avatar Systems to the summits unless they choose to do so themselves. These summits

are highly informative and beneficial to the teams. Details discussed at these team summits remain proprietary to the attending teams and may not be shared to non-attendees.

## 6.2 Team Webinars

XPRIZE will host a series of webinars throughout the Competition. Some webinars will allow teams to get to know each other. Others may provide Q&A sessions with experts in various technical domains. Participation in these webinars, while not mandatory, is strongly encouraged. Teams will be given advance notice of the exact dates for Team Webinars throughout the Competition.

## 6.3 Awards Ceremony

Formal announcement of the ANA Avatar XPRIZE winning team(s) will take place at an Awards Ceremony to be scheduled (tentatively) in early 2022.

# 7. COMPETITION TIMELINE



# 8. ADVISORY BOARD, JUDGES AND MENTORS

## 8.1 Advisory Board

XPRIZE will form a panel of relevant subject matter and technical experts to serve as the **Advisory Board (AB)** for the Competition. The AB will advise XPRIZE regarding the scientific and technical elements of the Competition. Each member of the Advisory Board (“Advisor”) will enter into an agreement with XPRIZE that will: (i) outline Advisor’s duties and obligations; (ii) require Advisor to maintain confidentiality of XPRIZE’s and team confidential information, in



accordance with the **Competitor Agreement**; and (iii) require each Advisor to acknowledge that he or she shall make no claim to any team's intellectual property.

#### 8.1.1 Composition of Advisory Board

The total number of AB members will be determined by XPRIZE. The AB will be independent of XPRIZE, the sponsor, and all teams and team members. No Advisor, nor any member of an Advisor's immediate family, shall participate, nor have any financial or other material interest, in any team or team member. All members of the AB shall promptly disclose to XPRIZE any such current, former, or expected future conflict of interest with XPRIZE, the sponsor, or any team or team member.

#### 8.1.2 Role of Advisory Board

The duties and responsibilities of the Advisory Board may include, but not be limited to: (i) assisting with the establishment of qualifications for the Judging Panel; (ii) recommending members of the Judging Panel; (iii) providing input related to testing protocols and judging criteria; (iv) and providing input toward the development of these Competition Guidelines.

### 8.2 Judging Panel

The Judging Panel will comprise highly qualified and impartial Judges. The Advisory Board will recommend the candidates it believes are best suited to serve on the Judging Panel. XPRIZE, in its sole and absolute discretion, will appoint the Judging Panel based on these and other recommendations. Each Judge will enter into a Judging Agreement with XPRIZE that will: (i) outline the Judge's duties and obligations; (ii) require each Judge to maintain confidentiality of XPRIZE and team confidential information in accordance with the Competitor Agreement; and (iii) require each Judge to acknowledge that he or she shall make no claim to any team's intellectual property.

#### 8.2.2. Independence of Judging Panel

The Judging Panel will be independent of XPRIZE, the sponsor, and all teams and team members. No Judge, nor any member of a Judge's immediate family, shall participate, nor have any financial or other material interest, in any team or team member. All members of the Judging Panel shall promptly disclose to XPRIZE any such current, former, or expected future conflict of interest with XPRIZE, the sponsor, or any team or team member.

#### 8.2.3. Role of Judging Panel

The duties and responsibilities of the Judging Panel will include, but not be limited to evaluating team compliance with 1) the Competitor Agreement, 2) these Competition Guidelines, and 3) the Rules and Regulations of the Competition. They will also be responsible for scoring and selecting teams that will proceed to each round of the Competition.

#### 8.2.4. Grounds for Judging Panel Decisions

Official decisions made by the Judging Panel will be approved by a majority vote of the Judges, following careful consideration of the testing protocols, procedures, guidelines, rules, regulations, criteria, results, and scores set forth in the Competitor Agreement, these Competition Guidelines, the Rules and Regulations of the Competition, and all other applicable exhibits to the Competitor Agreement. If any vote of the Judges results in a tie, then the Judging Panel shall determine, in its sole and absolute discretion, the mechanism to settle the tie. Similarly, if one or more teams are tied at any stage during the Competition, the Judging Panel shall have the sole and absolute discretion to settle the tie.

#### 8.2.5. Decisions of Judging Panel Are Final

The Judging Panel shall have sole and absolute discretion: (i) to allocate duties among the Judges; (ii) to determine the degree of accuracy and error rate that is acceptable to the Judging Panel for all Competition calculations, measurements, and results, where not specified in the Rules and Regulations; (iii) to determine the methodology used by the Judging Panel to render its decisions; and (iv) to declare the winners of the Competition. Decisions of the Judging Panel shall be binding on XPRIZE, the teams, and each team member. XPRIZE and teams agree to not dispute any decision or ruling of the Judging Panel, including decisions regarding the degree of accuracy or error rate of any Competition calculations, measurements, and results. Teams shall have no right to observe other teams' testing or evaluation, or to be informed of other teams' calculations, measurements and results, unless such information is made publicly available by XPRIZE.

### 8.3. MENTORS

Throughout the Competition, efforts will be made to connect teams with volunteer mentors who have expressed an interest in performing this role. Mentors are not guaranteed.

## 9. GLOSSARY

**Advisory Board:** A select group of prominent advisors who contribute their wisdom, knowledge and guidance to various aspects of the prize.

**Avatar:** The physical robotic entity at the other end of a telepresence system, operated by a human. **Note:** For purposes of this prize all uses of the word "Avatar" are interchangeable with "Robotic Avatar," "Physical Avatar" "Avatar System" or "Avatar Solution".

**Avatar Solution:** This refers to a Team's specific Avatar System (including the operator interface, the robotic Avatar and all sensors, software and mechanical parts) that will be used in the Competition.

**Avatar System:** This refers to the complete and total system consisting of the Operator and operator interface, the Robotic Avatar and all sensors, software and mechanical parts, and the environment or Recipient with which the Operator interacts.

**BMI: Brain-Machine Interface:** Included in this term are sensors that can measure various types of brain signals such as EEG. For the purposes of this Competition these must be externally worn and not be invasive.

**BBMI: Brain + Body Machine:** See BMI.

**Brain Computer Interface (BCI):** See BMI.

**Competitor Agreement:** A legal and binding document that details the responsibilities of competitors for the prize.

**Domain:** An area of need or opportunity.

**Finals:** The last set of testing events for the prize that will determine the overall winners.

**Finalists:** Teams that have been approved by the Judging Panel to advance to the Finals.

**Haptics:** Technologies that can convey sensations such as pressure, vibration, temperature and object form in a mediated experience that normally would be felt by a user interacting directly with physical objects.

**Human Controller:** Another term for the human that is controlling the Robotic (physical) Avatar.

**Interested Team:** A Team or individual that is interested in participating in the Competition and has created a profile in the XPRIZE internal POP system.

**Judging Panel:** The subject matter and technical experts who serve as an impartial and independent evaluation team for all aspects of this prize. They score the team submissions and make the final award determinations in both the Semifinals and the Finals Competitions.

**Mobility:** This refers to the Robotic Avatar's ability to physically move and/or navigate in a space.

**Operator:** The person in the Avatar System who is controlling the actions of the Robotic Avatar through some sort of Operator Interface. Also known as the **Human Controller**.

**Operator Interface:** The means (equipment, software, control devices) by which an Operator interface with the Robotic Avatar at a distance.

**Operations Guide:** The Operations Guide will detail the policies and procedures for testing including test scenarios, event operations, logistics, shipping, safety and other details to effectively participate in testing events. There will be separate Operations Guides for Semifinals and Finals testing.

**POP or Prize Operations Platform:** The standard internal XPRIZE portal for teams to input data for use in this Competition.

**Presence:** This is the sense that one's actions and senses feel as if they are truly experiencing a location other than the one where the user's physical body currently resides.

**Prize Purse:** This refers to money offered, won, or received as a prize. It also refers to the overall amount of funds allocated to all prizes in this Competition.

**Qualifying Submission:** A formal plan that outlines and shows proof of the team's capabilities and their progress towards developing a unique Avatar System that meets the Competition goals.

**Qualified Team:** This is a form in POP that must be completed by Teams no later than October 31<sup>st</sup>, 2019. It consists of a series of questions to be answered that outline the expertise, capabilities and plans for the functional Avatar Solution that each Team will be creating. It will also require an Executive Summary of up to four pages, consisting of no more than two pages of text and two pages of images, diagrams, or charts.

**Recipient:** The person receiving the actions of the Operator via the robotic Avatar.

**Registered Team:** A Team that has paid the required registration fee and is eligible to submit a **Qualifying Submission** for Judge review.

**Registration, Early:** The first of the two official registrations periods that must be met for teams to participate in this Competition.

**Registration, Final:** The last of the two official registrations periods that must be met for teams to participate in this Competition.

**Robotic Avatar:** See Avatar.

**Scenario:** See Testing Scenarios.

**Semifinals:** The set of testing events for the prize that will help determine which Teams progress to the Finals testing.

**Semifinals Verification:** This is a Team-provided update to ensure Teams are prepared to proceed to the Semifinals round of the Competition and consists of written and filmed components which will be reviewed by the Judging Panel.

**Semifinalist Teams:** Teams (up to 75) that have been approved by the Judging Panel to advance to the Semifinals.

**Simultaneous Localization and Mapping (SLAM):** the process of computing, building or updating a map of a physical environment while simultaneously keeping track of an operator's location within it.

**Team Summit:** A physical meeting that provides an opportunity for teams to meet with XPRIZE, interact and collaborate with other teams, and potentially industry, academic, government, media, and other stakeholders as well as potential investors and partners.

**Testing Scenarios:** These are the set of actions that a Team's Avatar Solution will complete and by which they will be judged.

**Wearables:** Included in this term are advanced sensors as well as body sensors like EMG, Skin Conductance and EKG. Such technologies can be used for semi-autonomous control (where appropriate), or possibly for embedded self-assessment of how the Human-Avatar System is performing.