

B2CI Video Game Challenge Rules

IEEE R2 SAC 2020

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1. **Introduction**

1.1. **Competition Title:** B2CI Video Game Challenge

1.2. **Competition Description**

Each team of game developers will design and code an original computer game that utilizes brainwave headsets. The computer game must have a major Brain-to-Computer Interface component. The game can be of any type or style.

On the day of the competition the students will bring their game preloaded on a computer or laptop. The student team will provide the judges with a headset that works with their game.

Judging will be subjective, but rubric based. Teams can use any headsets they choose for their games. Headsets can be commercial or open source. Extra points will be awarded for teams that bring equipment and/or signal processing software of their own design.

1.3. **Academic Goals**

Using a headset as a complementary input device, the game should teach the game player to focus the mind. The game player will learn to operate and manipulate HIDs using thought patterns as a replacement or in addition to hands/fingers to control conventional input devices.

The skills acquired by the game player should create opportunities to later use those skills to operate devices such as computers, wheelchairs, or prosthetic limbs. The neural input would be in addition to regular input.

The game developers will learn how to acquire and process data from brainwave headsets. They should also learn to appreciate the different brainwave frequencies, and the importance of positioning or location of the probes on the game players head. An ancillary objective of this event could be the creation of a new class of computer games that could potentially be commercialized.

1.4. **Competition Coordinator:** Steph Saloka

1.5. **Committee Co-Chairs**

- J. Max McQuicghan
- Garima Bajwa
- Sherwood Olson
- Boma Jack

2. **Participant Eligibility**

2.1. **IEEE Membership**

All participants shall be registered IEEE student members attending the university they identified when registering for the SAC.

2.2. Team Composition

Teams shall consist of one to five participants. A team of four or five participants may include no more than one graduate student who shall be considered an advisor. Teams may have faculty and/or non-faculty advisors, who will not count toward the team size. In the case of a team of participants, it should be possible to demonstrate that each individual made a contribution to the team's entry.

2.3. Number of Teams

There is no limit to the number of teams that one university may register for this competition.

3. General Rules

3.1. Self-Containment

The goal of the event is for student teams to create gameplay that utilizes a neural interface. One possibility, although not the only one, would be to maneuver and control the game's avatar based on brain waves being picked up from the game player/driver's headset. Those signals would be processed to send commands to the computer game.

Any number of other gameplay designs are possible, as long as the designers include some aspect of the game utilizing a neural interface. An example where conventional controllers might be used is the controller would move an avatar, while commands from the headset control the visibility of the avatar.

3.2. Dislodged Parts

Neither the game nor any computing hardware shall scratch, cut, burn, mark, damage, or destroy the interface connections, the walls, or any of the event facilities. The designed video game system shall not leave, drop, or lose any parts or components from the headset or other input devices, nor leave or drop parts from the computer/laptop while the game player is playing the video game.

Teams shall not use an energy source employing a combustion process.

3.3. Game Processor and Hardware Design

The objective is to create a unique game design and the associated signal processing. The headset itself cannot connect directly to any computing device, but must use Bluetooth or 802.11 radio communications from the headset to the computer which controls the game. The game itself can run on a laptop that is battery powered. Direct connections to electric outlets is allowed for the laptops, but not for the headsets.

Multiplayer games are allowed. This would require that the student team making such an entry to the competition would have to provide multiple computers, multiple headsets, and multiple game players/drivers.

Eyeblinks and use of gyroscopes in the headsets is allowed, but the student team must explain what they are doing and how it contributes to the game.

3.4. Video Game Design Restrictions

The design of the brain controlled computer game must be reasonable. The following is not a complete list, but guidance on what is not allowed. The game design shall not be:

- Obscene
- Overly violent
- Contain certain illegal activities
- Violate copyrights

3.5. Rules Violation

Any violation of these rules will constitute immediate disqualification from the contest.

4. Competition Rules

4.1. Presentation

The contestant(s) will make a brief presentation of their game design and an explanation of their utilization of brainwaves prior to the competition (5 minutes max), if time allows. Students will present their video game pre-installed on their own computer. The students will provide the judges with a headset that works with their game.

The students must designate one student as the “driver” of the game. That driver will give a live demonstration of the game to the judges. At the judges’ discretion, the judges might attempt to drive the game themselves.

4.2. Time

Each team is allocated a total of 15 minutes of access to their computer from the moment the contest administrator acknowledges the contestant(s) and grants access. This 15 minute time period is to allow for setting up the headsets and for initializing (booting) the game. It is hoped that this would be done before presenting the game to the judges, but this 15 minute period is the maximum.

Once a contesting team is in place, they will be given a test run to ensure that their hardware connections are correctly made. Once the team indicates that they are ready to start, they must demonstrate their game within the next 30 minutes.

If it happens that a game becomes immobilized, the owner may manually intervene to correct the problem. This includes checking wires and cables, checking the headset, and checking the game. Teams will be allowed to reboot their computers, but they must do so within the time limits established by the judges. The frequency of such corrections will be considered by the judges in the final ranking of contestants.

4.3. Stopping/Removing the Video Game

Any team operator may abort a run at any time. The judges may abort a run, at their discretion, and declare a given run void. Multiple runs are not expected, however the judges can allow a second run by one or more teams, solely at their discretion.

4.4. Reprogramming After Reveal

After the competition event is started, the operator shall not reprogram the software or hardware of the video game system.

4.5. Room Conditions

The illumination, temperature, and humidity of the room shall be those of an ambient environment. (40 to 120 degrees F, 0% to 95% humidity, non condensing).

4.6. Ambient Light and Radio Interference

Teams should not make any assumptions about the amount of sunlight, incident light, or fluorescent light that may be present at the contest site. Competing teams should also assume that there might be interference from devices in the room, such as radio emissions from fluorescent lights, or the equipment of competing teams.

5. Judging

5.1. Run Timer

The judges will start a run timer when they signal the start of the event.

5.2. Judges' Discretion

The judges reserve the right to ask the operator for an explanation of the team's video game and its actions. The judges also reserve the right to stop a run, declare disqualification, or give instructions as appropriate (e.g., if the structure of the event is jeopardized by continuing operation of that team's entry).

5.3. Changes During the Competition

Changing ROMs or downloading programs is NOT allowed once the game has started. However, contestants are allowed to:

- Change switch settings (e.g. to select algorithms)
- Replace batteries between runs
- Adjust Sensors
- Change speed settings
- Make repairs within the time limits of their event

The judges shall arbitrate, and will always be the final authority.

5.4. Recognitions

For this event there will be recognition of a first place team, a second place team, and third place in each of the three categories:

- All Students from the same 4-year institution
- All students from the same 2-year institution
- Mixed teams with students from both 4-year and 2-year institutions

Teams will be competing for awards within their category. Teams will be recorded and evaluated only against other teams competing in the same category. If a category has fewer than two teams, then those teams will be combined with the next smallest category.

5.5. Requesting Breaks

If requested, a break will be provided for a team. The judges shall arbitrate, and be the final determinant on the granting of such breaks.