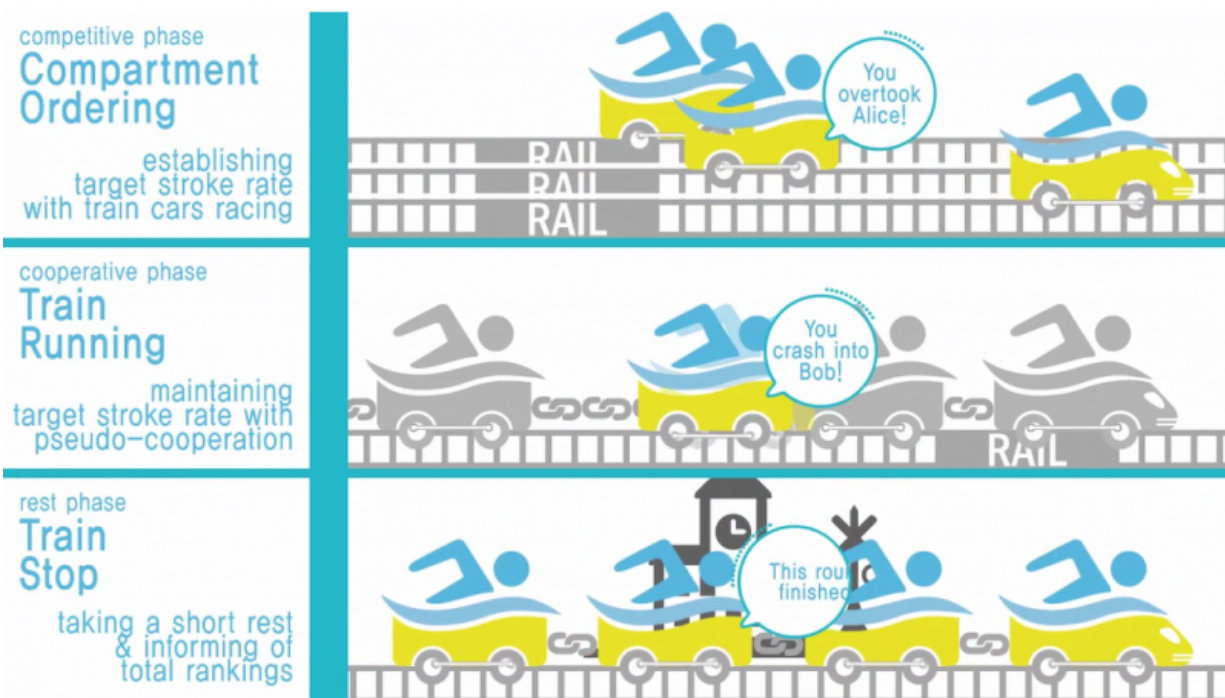# The SwimTrain exergame makes swim workouts fun again

May 13 2016, by Miran Lee

To many who swim for exercise, workouts come down to the monotony of doing laps—swimming back and forth in a pool. Over and over. Unlike other exercisers, who can make their routines less of a chore by adding a social component—working out with friends, family, or in groups—swimmers really haven't had many options, because

coordinating a group of swimmers is difficult. The Korea Advanced Institute of Science and Technology (KAIST) and Microsoft Research Asia (MSRA) report that with SwimTrain, their new cooperative "exergame" research project, you'll never have to swim alone again.

SwimTrain is the result of a research collaboration between KAIST and MSRA. The project targets something we can all relate to: exercise boredom. Swimming, while one of the best ways to get fit, can be tedious. The SwimTrain team thinks they have a way to make swimming a lot more exciting.

How does SwimTrain work? First, you slip your phone into a waterproof case and plug in some waterproof headphones. Then, you jump in. Players get matched up as a team to form a virtual "train," with each player controlling the speed of a single train compartment. Go too fast or too slow, and the game warns you of bumping into other compartments. Featuring narration, vibration feedback, spatialized sound effects, and background music, the immersive experience takes players through different modes of gameplay based on an interval training workout plan.

Each SwimTrain round consists of three phases:

Phase 1: Compartment ordering

Compartments race against other compartments. A compartment is ranked based on a swimmer's average stroke speed during the race.

Phase 2: Train running

Compartments are placed along the same track and run in a circle (like a merry-go-round). To earn points, each swimmer must maintain their current stroke rate with the target stroke rate established in the previous

phase. A compartment shifts with the movement of the current stroke rate relative to the target stroke rate, and it should travel without crashing into adjacent compartments.

Phase 3: Train stop

The virtual train stops. Every swimmer takes a short rest. The game narrates the final ranking of the current round and information for the next round, such as the duration of each phase and recommended stroke types.

SwimTrain accomplishes immersive gameplay by relying on advanced tech packed into a mobile phone. The barometer, accelerometer, gyroscope, and magnetometer track swimming activities, determining swimming periods, stroke, style, speed, and other events. This information is fed to a Network Manager based on the Microsoft Azure cloud, and is then delivered back to the game as rank and round data, determining the status of the player in relation to the train. It's also passed to a Feedback Manager, which provides the auditory and sensory feedback that make SwimTrain unique.

Preliminary feedback from users is positive—SwimTrain makes you feel like you're not alone in the pool. According to one test user, "Although [SwimTrain] didn't provide any visual feedback, I felt like I was swimming with others." Feedback is also indicating that SwimTrain is providing an immersive and enjoyable experience that's intense workout, too.

The project team's research is getting noticed in the world of human-computer interaction (HCI). CHI 2016, the world's top conference for HCI, has accepted the team's research for inclusion in the CHI 2016 Notes and Papers Program.

This collaboration with KAIST is a great example of how Microsoft values symbiotic relationships with partners in academia. "Not only do we have the ability to shape the future of Microsoft products, we have the chance to support and learn from some of the top professors in computer science," said Darren Edge, lead researcher at MSRA. Many of these collaborations lead to internships. "When a student makes a particularly promising contribution to a joint project, we can also invite them to spend time at Microsoft as a research intern. Everybody wins from such internships: we get some of the brightest PhD students to work on our projects, and the students develop new expertise and skills that they can apply to their university work with their professor."

Darren explains that this recently happened as a result of his ongoing collaboration with Professor Uichin Lee at KAIST. Following the completion of work on SwimTrain, Professor Lee's PhD student Jeungmin Oh joined Darren at MSRA for a six-month internship, working in another area. "We are all now collaborating on multiple projects in parallel. If any of them are as successful as SwimTrain, which won the third place award at the recent Microsoft Korea and Japan Day and has two accepted papers pending publication, I will be very happy indeed," he states.

The MSRA HCI group has in fact had a longstanding collaboration with academia: In recent years, MSRA has supported principal investigators for projects published at CHI 2014, CSCW 2015, and CHI 2016.

In the future, SwimTrain will focus on measuring more data, such as heart rate and maximal oxygen uptake, to determine the exertion level of a player's swimming. Also, the method might be applied to other group exercises, such as group jogging and group cycling. We look forward with anticipation to what SwimTrain might inspire.