

Brain Machine Interface for Fun Driving

Background

White Paper on Persons with Disabilities 2023
Health Ministry, Japan

There are 4.63 million people with a physical disability in Japan. (9.2% of the population)
The number of disabled persons tends to increase gradually. Japanese Government aims to realize an **inclusive society**. We try to remove **the barrier to driving** for people with disabilities!

Our Work

BRAIN MACHINE INTERFACE FOR FUN DRIVING

Brain Machine Interface (BMI) is a technology that allows the communication between the brain and other devices. Our plugin makes it possible to control a car in UC-win/Road with your brain waves. The disabled persons can also enjoy driving a car!



BMI Headset
(NextMind Dev Kit)

Features of Our BMI System

Client (Unity) and **server** (Python API Plugin) System

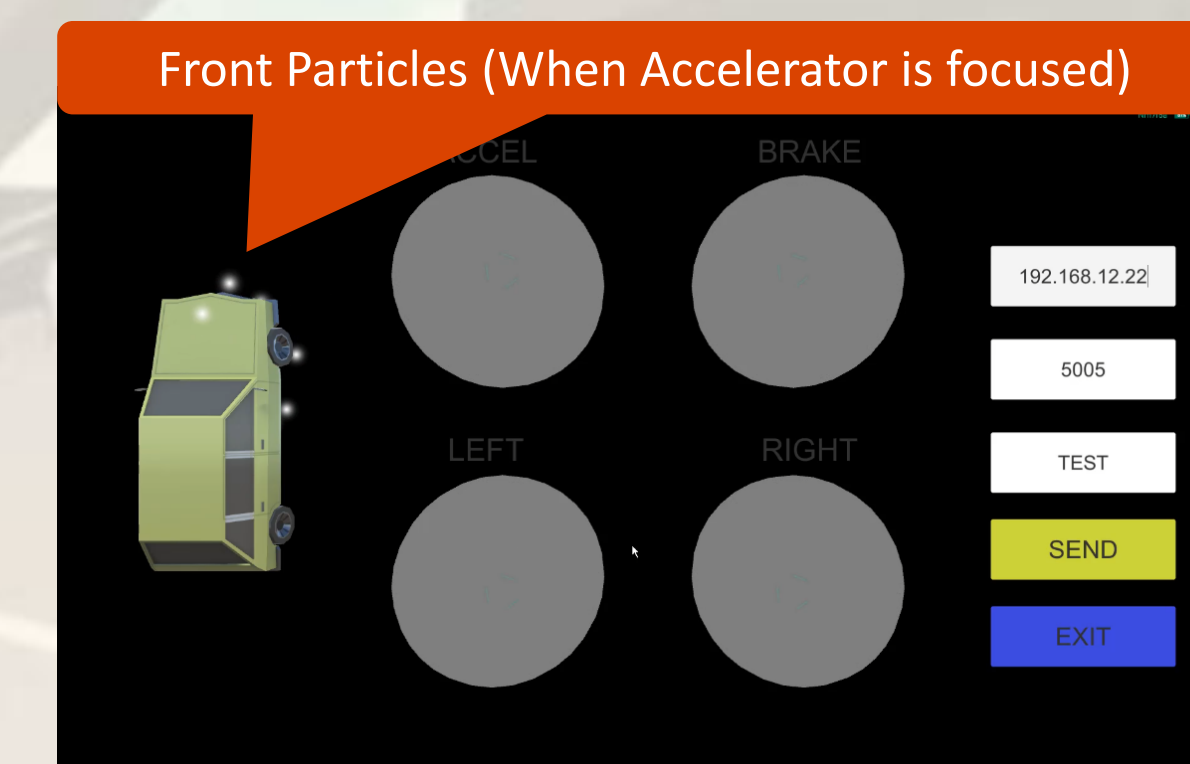
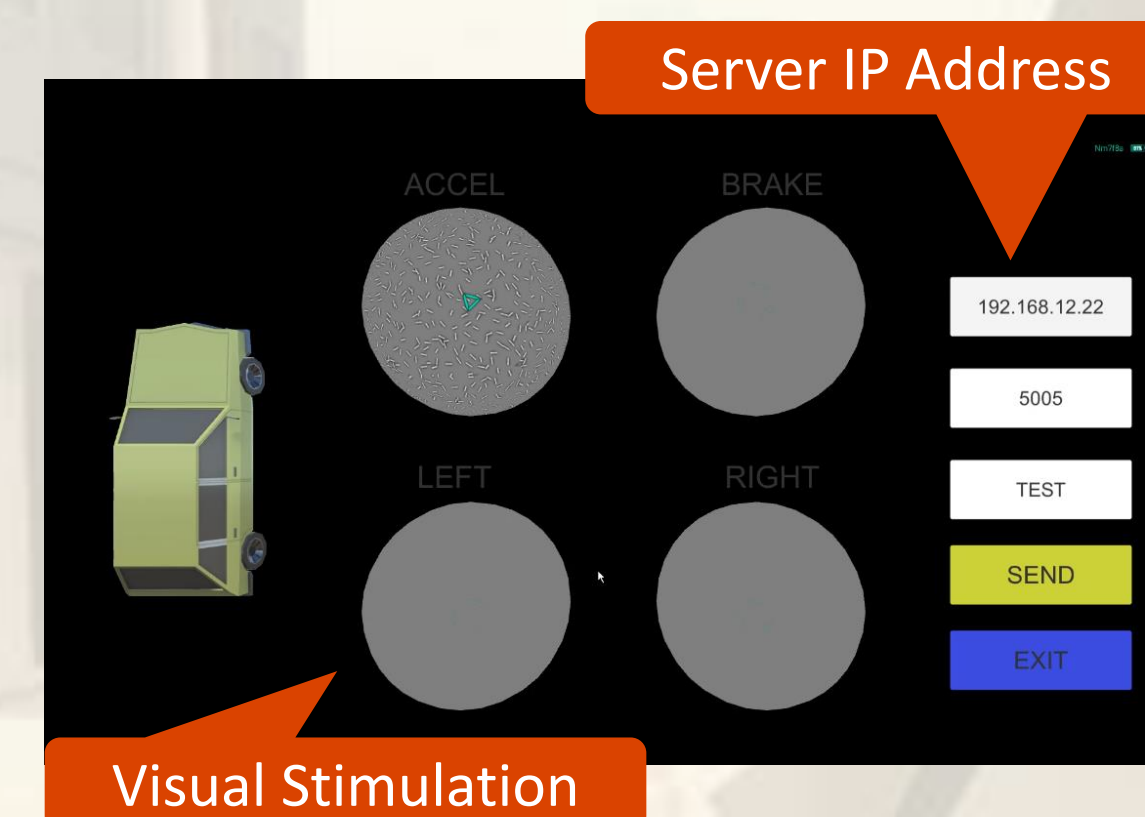
Client software displays **four visual stimuli** corresponding to driving actions (Accelerator, Brake, Left Turn, and Right Turn)

You can select one of the actions by your **brain waves**.

The selected action is transferred to the server to **control a car**.

Client Application

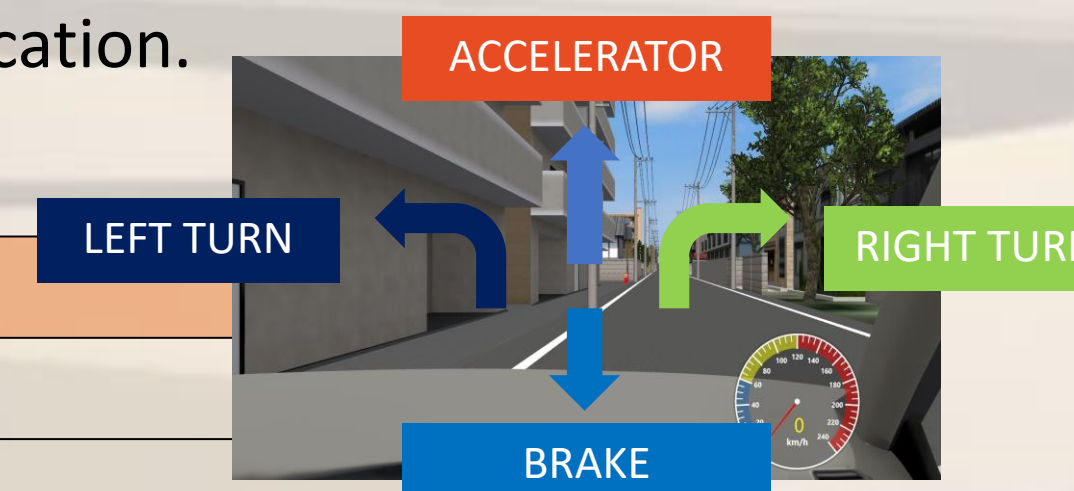
1. Input server IP address & port number
2. Focus on a visual stimulation
(Accelerator, Brake, Left Turn, and Right Turn)
3. Particles appear toward to direction of car movement
4. Focused action is transferred to the server



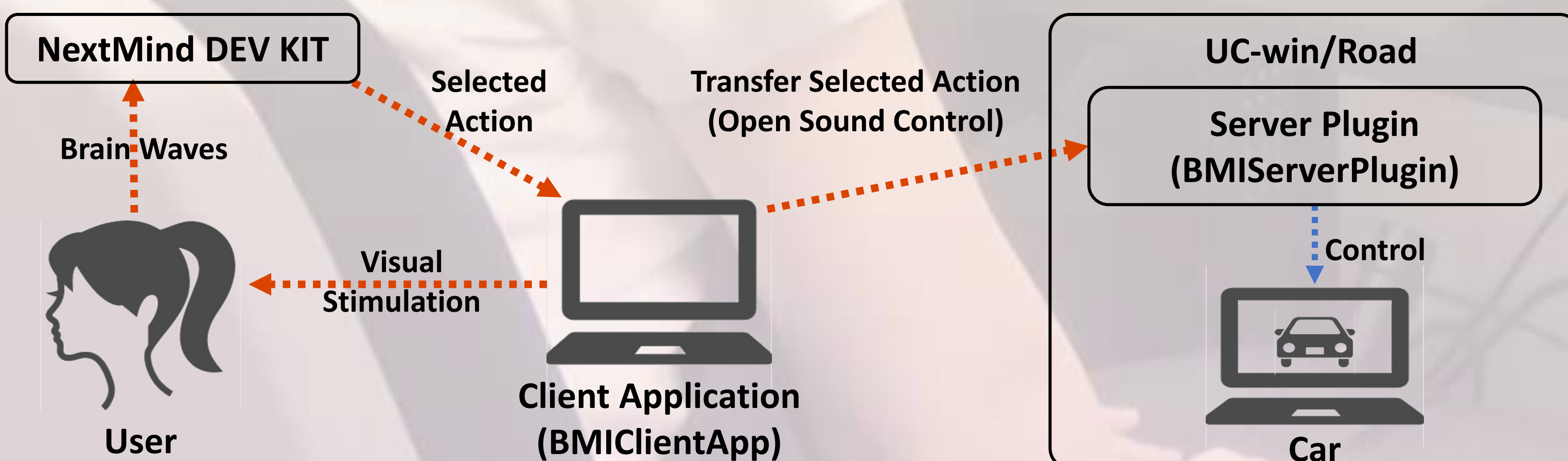
Server Plugin

A car acts according to the received action from the client application. Four actions of the car are implemented as Python API Plugin.

Received Action	Car Behavior
ACCELERATOR	Press on the accelerator pedal ($throttle = 0.2$)
BRAKE	Press on the brake pedal ($brake = 0.2$)
LEFT TURN	Turn the wheel to the left ($throttle = 0.1, steering = 0.5$)
RIGHT TURN	Turn the wheel to the right ($throttle = 0.1, steering = -0.5$)



Framework of Our BMI-based System



Conclusions and Future Works

Our BMI-based system provides an **enjoyable driving experience** for people with disabilities. We hope our system will contribute to an **inclusive society**.

Tomorrow will be more interesting for everyone!

Future works

Enhance cognitive performance of Brain Machine Interface.
(There are great differences between individuals)

Providing disabled persons with experiences of our BMI-based system.