A Prototype of Collaborative Augmented Reality Environment for HoloLens

Dawit Chusetthagarn[1], Vasaka Visoottiviseth[1], Haga Jason[2]

[1]Faculty of Information and Communication Technology, Mahidol University, Nakhon Prathom, Thailand

[2]Information Technology Research Institute, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

Abstact

This paper uses the concept spatial anchors of Microsoft by using Holotoolkits that install to Unity to create the collaborative environment in application. We will use this application to visualize a large datasets in data-intensive science for data exploration. Our collaborative AR environment will be demonstrated with a disaster management application that can be shared in the HoloLens as a proof-of-concept application.The collaborative environment can work through the server in Holotoolkits launched in Unity.

Software

unity

blender

Visual Studio

Features

Background

Dataset

This project uses a dataset from a website of Japan Ministry of Land, Infrastructure, Transport and Tourism [1]. This data are from various sensors around Japan which collect a variety of weather related data. We use

- 7 types of sensor (rain, snow, water, dam, shore, camera, and quality)
- 10 minutes interval between each data
- the data is from 26 November 2016 01:00:00 to 26 December 2016 03:30:00.

HoloLens

HoloLens is an AR glasses released by Microsoft to allow the user to interact with holograms in a real-world environment. HoloLens has three basic interaction modalities, which are

- Gaze is the function to point where the cursor is.
- Gesture is the function to detect the specific movements as a command.
- Spatial mapping is a function to create virtual mesh world from the real-world surface.

Anchor

This concept from Microsoft is the method to save data of an object or hologram by using

- Anchor [2]
- Coordinate System [3]

This implies that an anchor must be created for each object after users interact with the object, thus ensuring that every user will have the same view of the object.

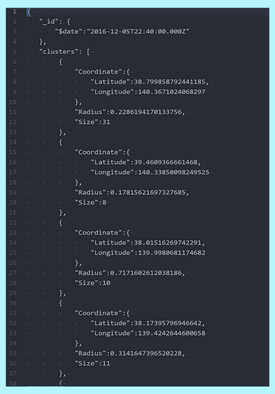
Implementation & Result

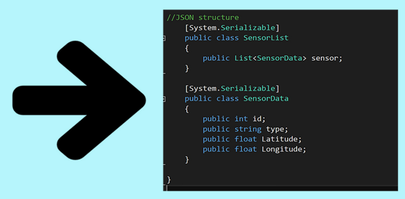
This project use data from www.river.go.jp of Ministry of Land, Infrastructure, Transport and Tourism in Japan. The data is crawled by previous internship student, so I got the information such as location of each sensor (Latitude, Longitude), and specific detail for each type of data.

- There are 7 types of sensor (Rain, Snow, Water, Dam, Shore, Camera, Quality)
- Each data have 10 minutes interval
- It is stored on MongoDB
- We export as CSV and JSON file

JSON file is a nested JSON and C# script cannot run, so I create new simple JSON structure and put some data in that structure to read. The simple structure has 4 data which can be added more informative data are

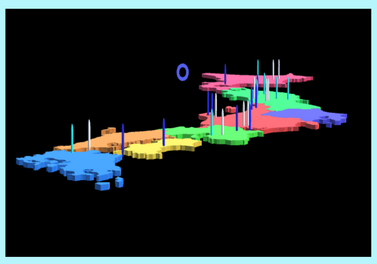
- id
- type
- Latitude
- Longitude

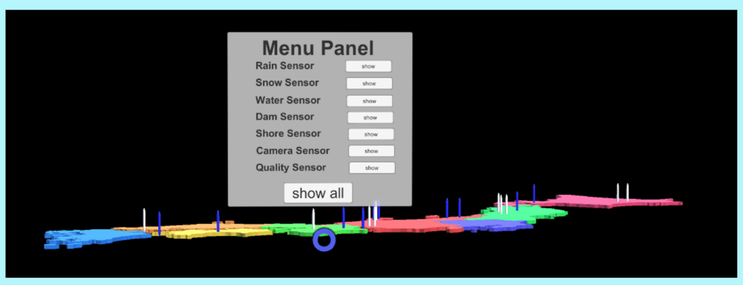




```
//JSON structure
    [System.Serializable]
    public class SensorList
    {
        public List<SensorData> sensor;
    }

    [System.Serializable]
    public class SensorData
    {
        public int id;
        public string type;
        public float Latitude;
        public float Longitude;
    }
}
```





We create Japan map in the Blender and put it in unity project. In this project, we add many scripts to create every feature that we design. The above pictures show all of the components that should be in the application which are

- Menu Panel
- Japan Map
- Sensors

Each pillar represents the sensor and the color will represent different types of the sensor. In this prototype has three types of sensor. Light blue pillar is a rain sensor. Blue pillar is a water sensor. White pillar is a snow sensor.

References

[1] Japan. Ministry of Land, Infrastructure, Transport and Tourism, http://www.river.go.jp/

[2] Spatial anchors - Mixed Reality, https://docs.microsoft.com/en-us/windows/mixed-reality/spatial-anchors

[3] Coordinate systems - Mixed Reality, https://docs.microsoft.com/en-us/windows/mixed-reality/coordinate-systems

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