ANGEL NAVIGATION

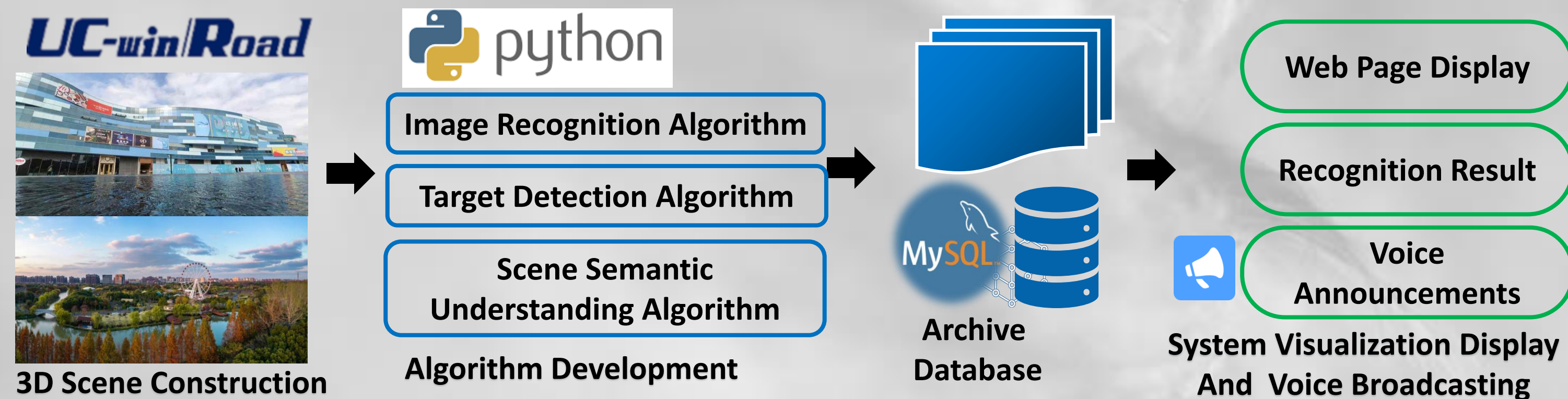*"Give a blind person a pair of eyes"*

Background

According to data from the World Health Organization (WHO), as of 2020, approximately 285 million people worldwide were affected by varying degrees of visual impairment, of which approximately 36 million were completely blind. Blind navigation can improve the quality of life, autonomy, and safety of visually impaired individuals, enabling them to better integrate into society and participate in various activities.

Concept

To help visually impaired people live better, we have designed smart glasses that use UC-winRoad software to simulate a blind person's perspective and convey details about the journey, such as the use of transportation, taking buses, visiting parks, etc. The visual content will be processed with an algorithm before it is reported via voice.

System Architecture

UC-win/Road — 3D Scene Construction

python

Image Recognition Algorithm
Target Detection Algorithm
Scene Semantic Understanding Algorithm

Algorithm Development

MySQL — Archive Database

Web Page Display
Recognition Result
Voice Announcements

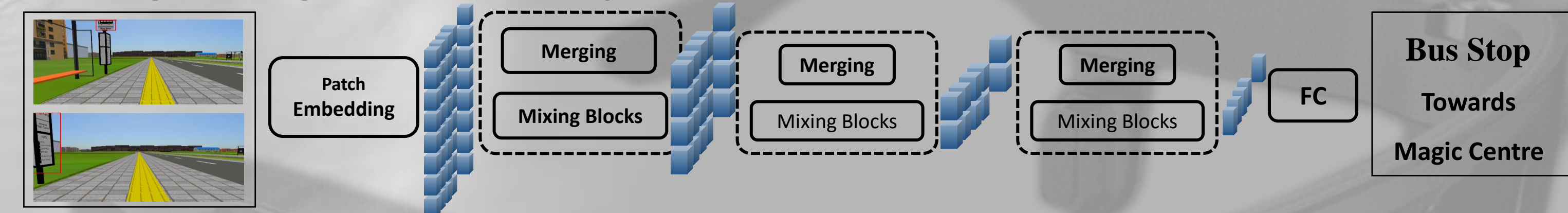System Visualization Display And Voice Broadcasting

We use UC-win/Road's first perspective to simulate the content captured by glasses, including scenes of bus stops, on buses, and park lights. Different types of algorithms were applied on captured data. Different types of algorithms were applied to captured data for various purposes. We use image comprehension algorithms to take screenshots of the images from the perspective for understanding over time. Including scenes of bus stops, buses, and park lights. For example, the bus stop signs will tell blind people which bus route to take, determine whether the bus has arrived, and if so, tell the blind person that the bus has arrived. The detection algorithms are used to identify traffic lights and return whether the light in front of the blind person is red or green.

1: Magic Centre   0.997
2: N15   0.908
3: PMDEC   0.860
4: Century Garden   0.950
5: Garden Plaza   0.928
6: • NTTMSC   0.836
7: • Bomba Cyberjaya   0.931
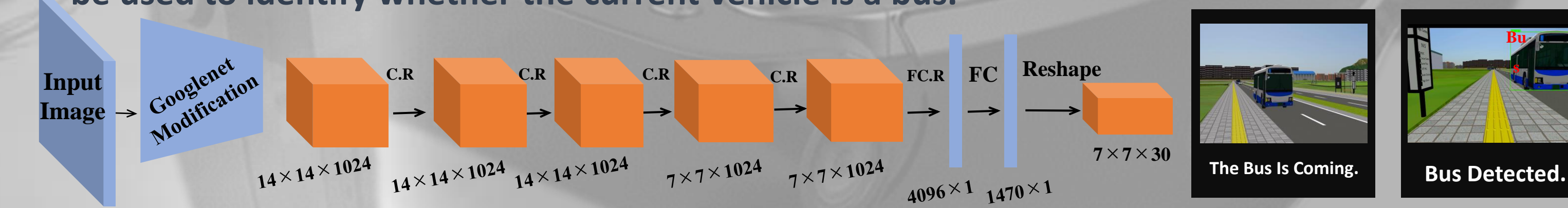8: • Magic Centre   0.920

There is a public restroom ahead.
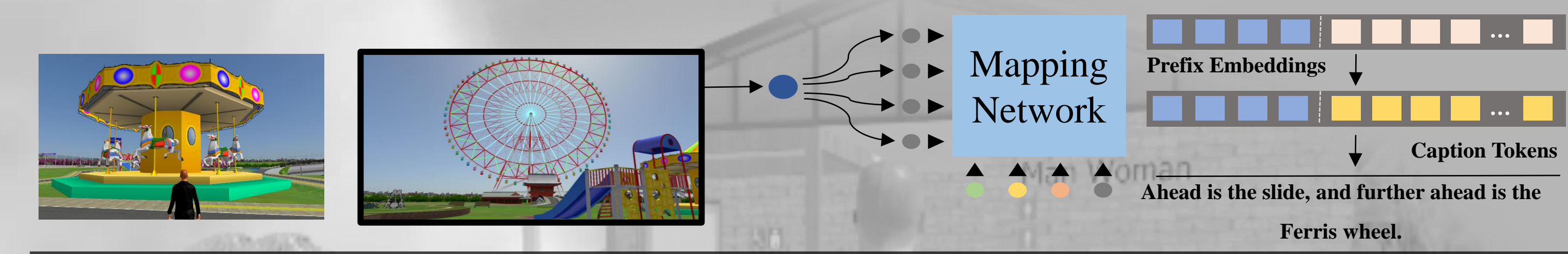
Algorithms

1. **Image Recognition Algorithm:** When the blind person approaches the bus stop sign, the recognition algorithm can identify the destination of the detected bus.

Patch Embedding — Merging / Mixing Blocks — Merging / Mixing Blocks — Merging / Mixing Blocks — FC — Bus Stop Towards Magic Centre

2. **Target Detection Algorithm:** When a vehicle enters the bus stop, the detection algorithms can be used to identify whether the current vehicle is a bus.

Input Image — Googlenet Modification — C.R $14\times14\times1024$ — C.R $14\times14\times1024$ — C.R $14\times14\times1024$ — C.R $7\times7\times1024$ — C.R $7\times7\times1024$ — FC.R 4096×1 — FC 1470×1 — Reshape $7\times7\times30$

The Bus Is Coming.   Bus Detected.

3. **Scene Semantic Understanding Algorithm:** After entering the park, blind people will be assisted by this algorithm in sightseeing, and when encountering different entertainment facilities or public toilets, they will be told which direction they are in through voice broadcasting.

Mapping Network — Prefix Embeddings — Caption Tokens

Ahead is the slide, and further ahead is the Ferris wheel.

Angel Navigation

You entered the bus stop. Please check the route of the bus forward. The station sign is in front of you on your left.

The light is red please stop. Green light, we can go.

The current bus route is N15.

Future Improvements

- Improve the speed and accuracy of the algorithm.
- Optimize voice broadcast to make it sound more comfortable.
- Add some emergency situations for blind people.
- Optimize the model to look more realistic.