1.

Good morning everyone.

I' d like to thank you for giving me the chance to present here today.

My name is Shunsuke Onuki. I'm going to start my presentation.

My study’s title is The Development of WiFi-Based Indoor Navigation System Using Augmented Reality.

2.

I' m going to proceed with the presentation in this order

3.

I’d like to start by talking about Introduction.

4.

5.

The objective of this research is to develop a practical indoor navigation application for smartphones using the above method. In addition, by using AR techniques to visually support route guidance, we aim to realize guidance that is more visual, intuitive, and easier to understand than general navigation applications.

6.

This section describes the actual application we developed.

7.

We developed an indoor navigation application for smartphones that can be used inside the research building at the University of Aizu.

This application guides you through the various rooms in the building, allowing you to reach the desired room without getting lost, even in buildings with complex internal structures.

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The main actions of this app are as follows:

position tracking, selecting the desired room from the room list, guiding the user to the desired room using AR technology and checking your current location and trajectory on the map

9.

The environment for development is as follows：

We used Unity to develop this application.

Unity is a game engine provided by Unity Technologies that is widely used not only for games but also for developing various applications.

AR Core is Google's platform for building augmented reality (AR) applications for Android, and enables the development of AR content in Unity by including AR Core.

I used a Galaxy s9 to test it on a real device, and the android version is 10.

10.

Next, I' d like to explain the first of the app's main functions: position tracking.

The method for estimating the user's position consists of two steps: RSSI distance calculation and Trilateration.

11.

The first step is calculating the distance between the AP and the smartphone to calculate the user's location.

To calculate the distance, we use RSSI.

RSSI stands for Received Signal Strength Indicator, which means the strength of the radio signal received from the AP.

AP stands for Access Point, which acts as a repeater for the router.

The distance between the AP and the phone is calculated using the following formula.

12.

After the distance is determined, the user's position is calculated using Trilateration.

Solving a system of equations consisting of a circle whose radius is the distance from each of three or more APs, we can find some coordinates.

Divide the polygon consisting of these coordinates into one or more triangles.

13.

The center of gravity of the polygon is then obtained by the sum of their centers of gravity.

That is, it is estimated to be the user's location.

14.

次に目的地の設定についてです。

この画面で選択された目的地はデータベースに登録され、現在地から目的地までのルートが計算される。

15.

次にARナビです。

このアプリのAR機能はARCoreの環境認識によって動作します。現実空間を仮想交換座標に変換することで、指定した位置にオブジェクトを配置される。このアプリでは、目的地までの経路が画面に表示され、それに伴って直進や右折、左折の指示がユーザーの携帯電話に表示される。

16.

また、このアプリではユーザーの軌跡を地図で確認することもできる。