USING AN ANDROID SMARTPHONE FOR WIRELESS PRESENTATION REMOTE CONTROL AND ULTRASOUND ENABLED POINTING

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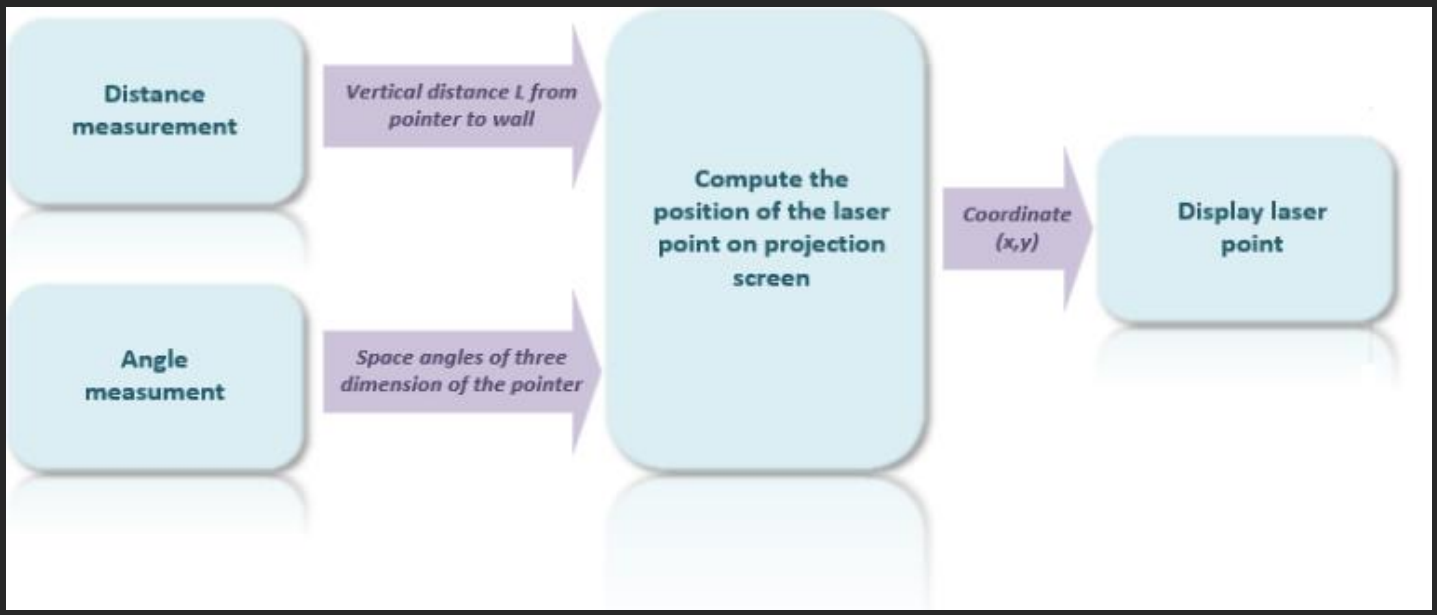
1. INTRODUCTION

Our FYP primarily aims to emulate a laser pointer for use in classroom lectures by utilizing an Android smart phone equipped with Wi-Fi, an ultrasonic sound emitting speaker and a sound gathering microphone. It relies on ultrasonic location techniques rather than an actual laser beam. A secondary aim of the project is to provide presentation remote control via Wi-Fi without the use of a flash memory receiver.

2. OBJECTIVE

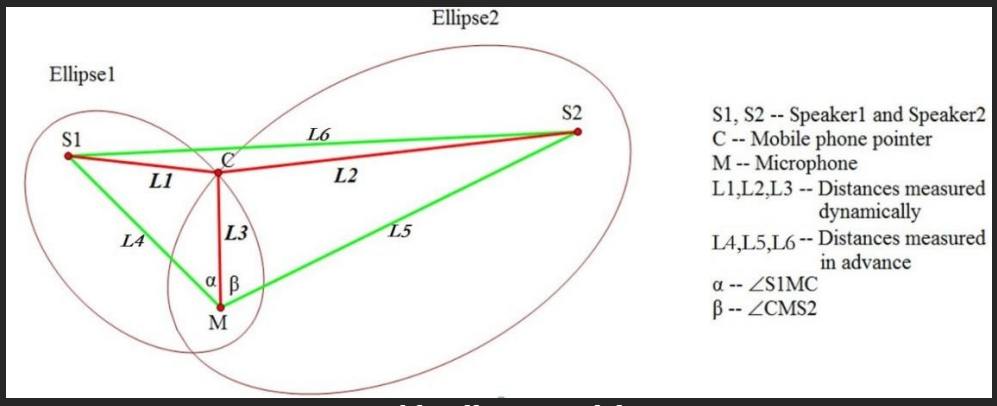
a. Setting up TCP connection for a PC server and an Android smart phone client via WIFI
b. Developing a positioning algorithm to mimic the function of a real laser pointer.
c. Developing a program to remotely control the PC PPT.
d. Designing user interfaces for both PC and Android smart phone.
e. Integrating all the parts of the whole system and carry out testing.

3. DESIGN FLOW

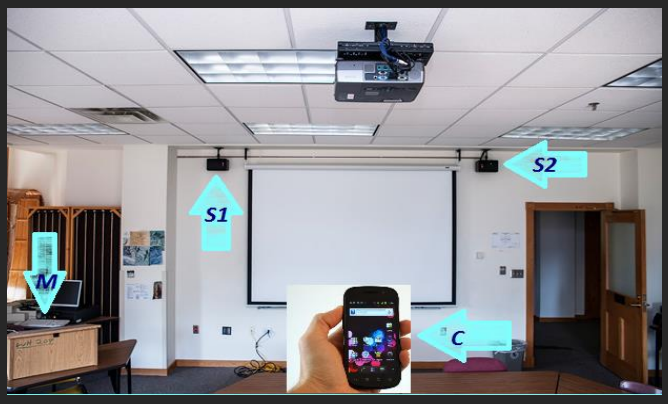


4. METHODOLOGY

4.1 Measuring Vertical Distance from Mobile Pointer to Projection Wall

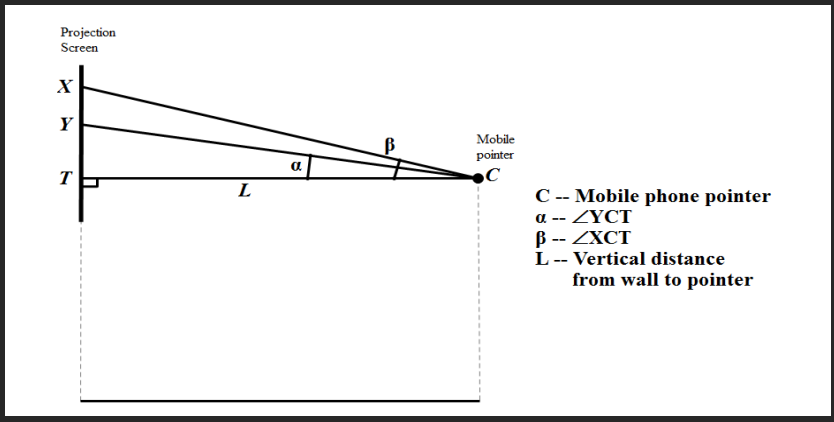


Double-ellipse Model



Based on an existing technology, Beep-beep, we are able to measure L1+L3 and L2+L3 relatively accurate with the help of ultrasonic software. Also, by doing measurements in advance, we know the value of L4, L5 and L6 since the positions of the loudspeakers and the microphone are fixed in a lecture room. Using the properties of ellipses and the magnitude of ∠S1MS2, we will be able to compute angle α , β and then the length of segments L1 and L2. So the entire instant position data are known by our system.

4.2 Calculating Real Displacement of Laser Point on Projection Screen



With the distance measured in 4.1 together with the smart phone rotation angles (α or β shown above), which we collect the data by using the Android smart phone's built-in hardware accelerator. By combining these two factors, distance and angles, and processing the data, we can determine the coordinates of the laser point on the projection screen.

5. TESTING AND EVALUATION

5.1 Testing

5.1.1 Testing the connection between the smartphone client and the PC server ✓

5.1.2 Testing the ultrasound generation, transmission and analysis ✓

5.1.3 Testing static mobile phone localization ✓

5.1.4 Testing the wireless remote control ✓

5.1.5 Performing integration testing ✓

5.2 Evaluation

After we finished all the testing, we believe that this Android application provide a blueprint for future development of a wireless presentation remote control and pointing app. There are many college lecturers all over the world, and there are huge demands in a lot of large companies where meetings require the use of PowerPoint presentation, so app like this would be very handy.

However, there are a lot of improvements that we need to consider if we want to bring the smart phone laser pen into Android market. For example, we need to refine the localization so that it could work in any sized classroom, in the hand's of any lecturer and with any normal speakers and Android smartphone. Currently, it only works under ideal conditions.

6. CONCLUSION

A. ABOUT OUR PROJECT

Objectives ACHIEVED!

B. RECOMMENDATIONS FOR THE FUTURE DEVELOPMENT

- Using ultrasound instead of 6000Hz, 6300Hz or 6600H
- Design a higher accuracy and efficiency algorithm than Double-Ellipse if possible
- Try implementing on IOS
- To use this technic in other area of Engineering