

## 1. Abstract

Earthquakes are destructive natural disasters that scientists are still unable to predict their occurrences. Therefore, we designed this Indoor Emergency Evacuation System (codenamed Be-live) using the Bluetooth 4.0 technology and indoor maps. The maps will be displayed on a smartphone equipped with various sensors. The sensors and the App will guide the user of the smartphone to escape outside from the indoor environment.

## 2. Description of the system

When the smartphone receives warnings of seismic activities, our app will start execution automatically. It detects dangerous conditions nearby, and guides the user to the nearest exit to escape from the shaking building (see Figure 1).

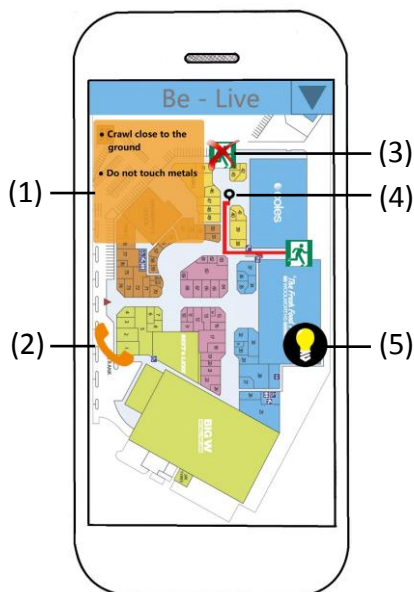


Figure 1 the smartphone App interface

- (1) Display safety precautions: the App will advise the user for possible dangers based on the information transmitted by the devices located throughout the building and received by the smartphone.
- (2) Press this button to make an emergency phone call.
- (3) Determine the damage condition of the emergency exit based on sensor

information.

(4) Display the current position of the user.

(5) Press the button to turn on the flashlight.

## 3. System architecture

When the government issues earthquake warnings, the warnings will be transmitted to the smartphone and the fixed devices throughout the building via the Internet. At this time, the preinstalled devices will emit location beacon signals and detect possible dangers in the surrounding areas. Simultaneously, the smartphone will calculate the location of the best exit based on the beacon signals, and guide the user to the exit. Additional information regarding safety precautions will be displayed on the smartphone to advise the user to take proper actions to avoid dangers (see Figure 2).

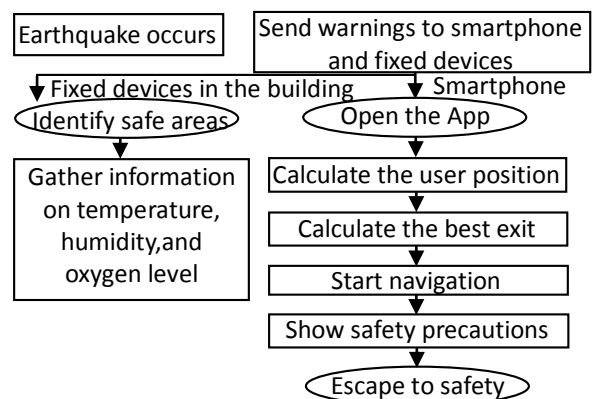


Figure 2 the flow of system operation

## 4. Conclusion

Our team completed this App through discussion, collaboration, and hard work. We believe that this system can effectively reduce the risk of injuries to indoor workers when earthquakes occur. Because the system displays the best escape route on the smartphone, there is a higher possibility that the user can remain calm and safely evacuate from the building. The system also displays various safety precautions on the smartphone based on sensor signals to alert the user to avoid danger in the emergency situation. We believe that this system will be very useful in minimizing casualties and losses from collapsed buildings.