Study on how RSSI-Distance Correlation can expedite the Disaster Recovery Process

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OBJECTIVE

Through our project, we offer an extensive study on RSSI-Distance correlation through experimental analysis . This study intends to support implementation of an IOT-Based System that expedites the disaster recovery process.

PROBLEM STATEMENT

Most firefighters/Disaster recovery personnel risk their own lives to volunteer and save the victims. One of the challenges faced in these scenarios - Inability to determine if a victim is alive(unconscious) or dead. Timely medical care is the most important factor behind success of a post-disaster operation.

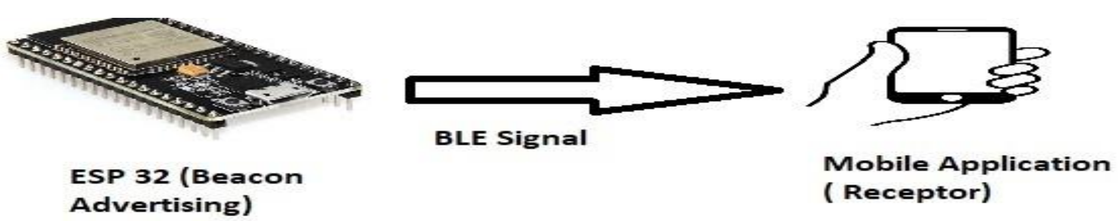
PROPOSED SOLUTION

In Disaster prone zones, we propose the implementation of an application that monitors the heart rate/pulse of a person and feeds this information to a Disaster Recovery team. The wearable IOT device (with a sensor) will activate only when a disaster occurs. Through our project, we came up with an extensive study on how RSSI strength varies with respect to various types of obstacles. This data helps us compute the accurate distance from the beacon while implementing such a system.

WORKING PRINCIPLE

RSSI is used as a parameter to determine the distance between the transmitter and receiver using a propagation model. The propagation model takes into account the attenuation of the signal due to factors such as distance, obstacles, and interference.

Formula used to compute distance : Distance = 10^((TxPower - RSSI) / (10 * n))



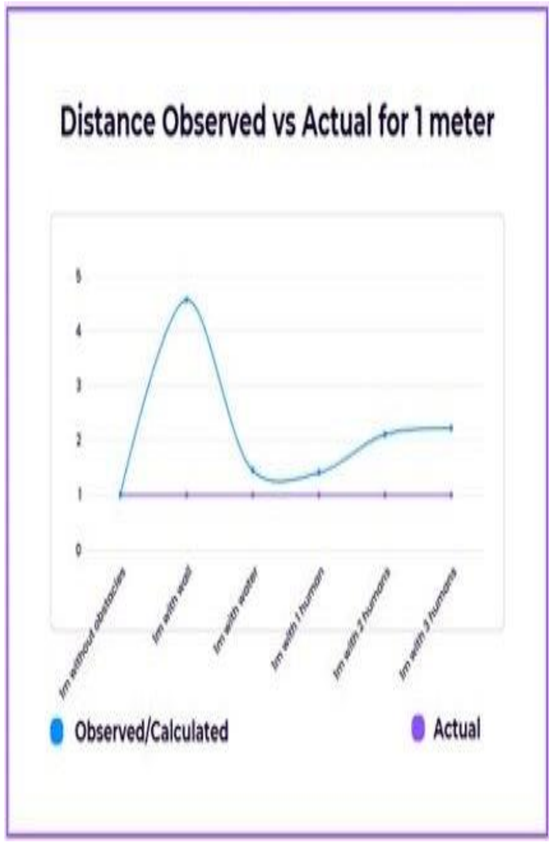
CONCLUSION AND FUTURE SCOPE

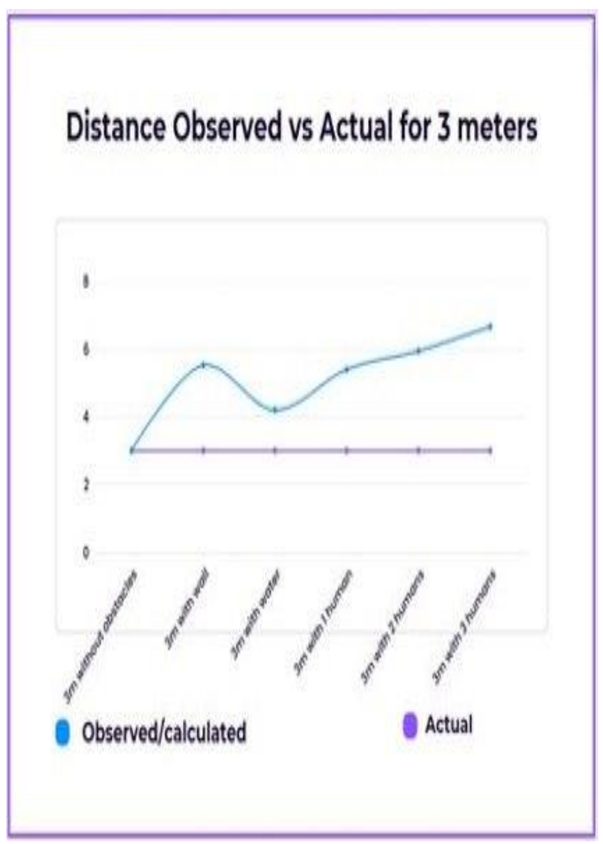
In conclusion, this project demonstrates the feasibility of using an indoor positioning-based IOT system to help disaster recovery teams identify and locate victims even in the presence of interference such as debris, or water. We provided an inference to compute the actual distance from the receptor. As a future scope, we suggest the use of machine learning algorithms to improve accuracy of distance computation based on RSSI readings.

EXPERIMENTAL ANALYSIS

1. We used Arduino programming to configure ESP32 as a transmitter that emits BLE signals once every 20 seconds.
2. Once the code is successfully compiled and uploaded to the device, the BLE signals can be read through an application on a mobile device – BLE Scanner.
3. Make a note of the RSSI reading for a set of at least 20 observations and compute the mean, standard deviation values.
4. Repeat steps 2-3 with various types of interference – Wall, Water, and 1-3 humans.
5. Compute distance based on mean RSSI readings for every scenario
6. Analyze and compare the actual distance with the calculated distance and draw inferences based on the results. Repeat the experiment for 1-meter and 3-meter distance readings.

INFERENCES/OBSERVATIONS





Project GitHub Link :
https://github.com/kskushal/IoTProjectTeam6

Video Presentation Link :
https://drive.google.com/file/d/1vkEywDRvGYRYBMZSqE0iyyl1_V4hFKy_/view?usp=share_link