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An Open-Source Solution for Mobile Robot Based Environmental Sensing

J. Grönman, J. Viljanen, J. Vihervaara, and M. Saari

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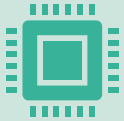
Introduction



Internet of Things-based devices and collected data.

Existing data collection methods often rely on sensors in fixed locations to obtain environmental measurements. A more flexible solution will be achieved by equipping an autonomous mobile robot with sensors.

In this paper, we present a low-cost solution based on open-source components. The solution utilizes a robot operating system, sensor and IoT-board based on open-source implementation.

Background

- Hardware
  - Turtlebot 2
  - Raspberry Pi
  - RuuviTag
- Software
  - ROS (Robot Operating System)
  - InfluxDB
  - Grafana

Implementation

- Earlier study: healthcare

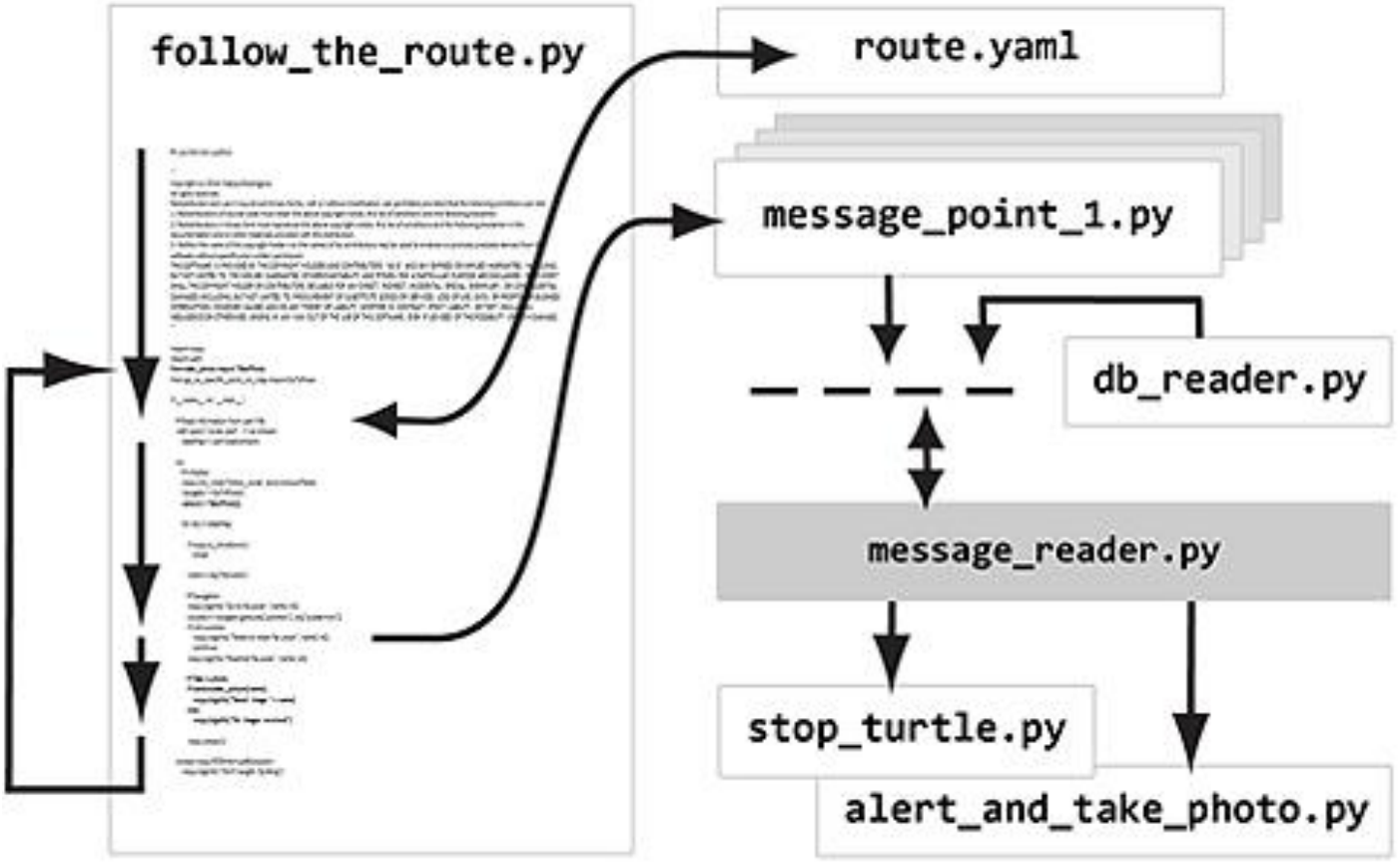
- The goal was to create a robotics solution with an autonomously operating mobile robot capable of utilizing IoT devices and sensors. The solution supports browser-based implementation and the robot is remotely controllable. It is possible to connect different sensors to the unit, including temperature, humidity, motion or light sensors.

- The implementation follows open-source principles and the robotics solution utilizes software found on the official ROS website. The user interface is implemented according to the current web design trends by using HTML5, CSS and JavaScript.

Implementation

- Hardware and remote controlling
- Software connections
- Data transferring and data visualization
- ROS architecture
- Programming modification

Implementation



Implementation

- Figure shows the complete layout of the user interface in the browser window. This view acts as the front page of the user interface. With browser-based implementation, the same action logic can be utilized both locally on the touch screen of the robot and in the interfaces of remote devices.

Conclusion

- In this study, we introduce the low-cost environmental sensing solution based on a mobile robot and open-source components.
- The pilot project shows that the low-cost robot can also provide advanced functions with the help of ROS and sophisticated software components.
- The sensor used in the pilot project was cheap and easy to deploy. However, the sensor was able to measure the environmental parameters with sufficient accuracy.
- In addition, the sensor can be customized to better fit the needs of the application area because its implementation is based on the open-source approach.
- The main objective of this study was to provide a low cost and flexible solution for mobile robot-based environmental sensing. The solution used in the pilot project satisfies our design target.

Thanks!