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FORGETME NOT: Memory Aid Using RFID Object Detection and WiFi Communication

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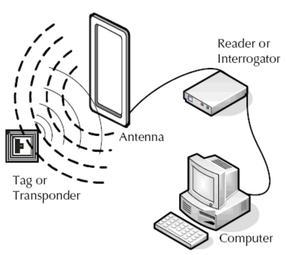
Introduction

In London alone, almost 22,000 people in the last three years required the assistance of the fire department because they had been locked in or out of their homes.[1] These incidents could have been avoided if the victims had remembered their keys. By utilizing RFID technology, we've created a user-friendly, home-integrated reminder system that ensures the user has everything they need each time they leave the house.

RFID



Radio Frequency Identification (RFID) uses radio frequency electromagnetic fields to communicate over distances of up to 30m. System specifications depend on the type of tag used (active or passive) and the read frequency (100 kHz – 5.8 GHz).

Technology / Components

Arduino Uno R3: A single-board microcontroller to manage the sensors and instruments, with 32kb of memory, as well as open-source software.

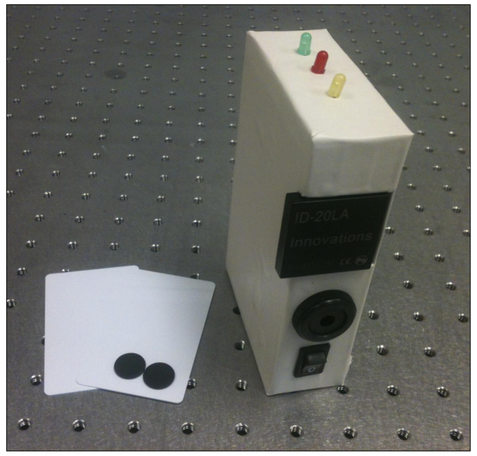
ID-20 RFID reader and tags: A low-frequency system with an advertised range of 20cm. Although a high-frequency system would have better range and minimal interference, the ID-20 meets our budgetary restrictions and is sufficient for a proof-of-technology model.

CuHead Wifi Shield for Arduino: Provides wireless connectivity to the Arduino, allowing the system to host a server on the local internet.

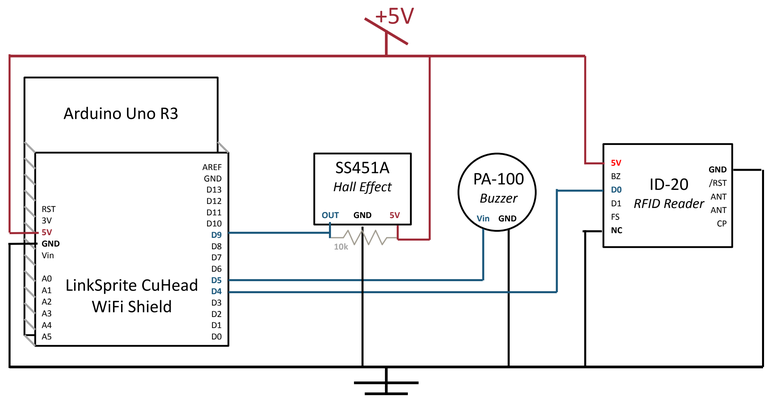
SS451A Hall Effect sensor and **magnet**: A simple proximity sensor which indicates when the door is opened

A **PA-100 piezoelectric buzzer** and **LEDs:** Provide audiovisual feedback when an object is forgotten.

Device Overview

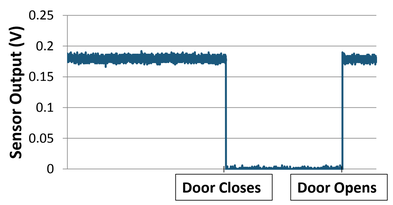


ForgetMeNot consists of a compact central device which houses the Arduino, RFID reader, and Wifi host, and is affixed to the wall near the door. The Hall Effect Sensor monitors the door and tags are attached to important objects like a wallet.



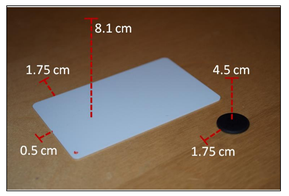
The Arduino supplies 5V to the other elements of the system. Three digital pins are used (4, 5, and 9), and the CuHead Wifi Shield reserves three more (2, 3, and 8).

Effect of Magnetic Field on Hall Effect Sensor



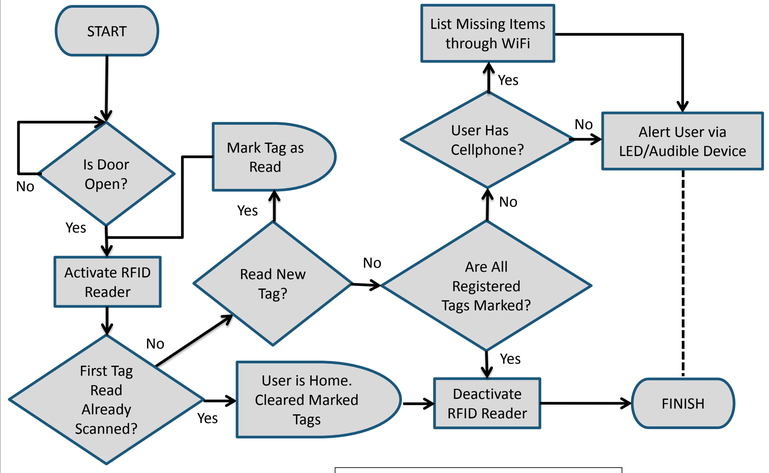
As the magnet moves out of the sensor's range, voltage output increases to a constant value of .18V.

Tag Read Ranges



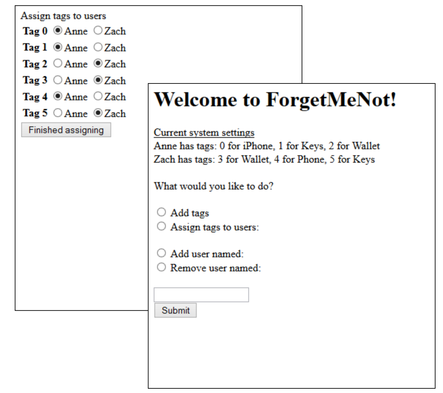
Tags can be read up to 8cm away. This read range is affected by the type and orientation of the tags.

User Feedback



(Above) If expected tags are not present, an audiovisual alarm will go off.

(Right) The WiFi-shield hosts an HTML server, where the user can edit the users in the system and add or assign tags to users.



Conclusions and Future Work

ForgetMeNot is an effective model for an RFID-based memory aid system.

An ideal system would include the following upgrades:

- High-frequency RFID (~900MHz) to allow simultaneous tracking of multiple tags at a range of 1-2m
- A more powerful processor with additional memory
- A smartphone app with PUSH notifications

Acknowledgements and Reference

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[1] London Fire Brigade. "Firefighters Attending One 'Locksmith Job' Per Hour Title." [London]. 29 May 2012: http://www.london-fire.gov.uk.