

Low Cost IOT system for Residential Automation using Open Hardware and Open Software with a Focus on Disabilities

Motivation

- Many of the new technologies are not reachable by all the members in a society;
 - Special Needs (SN), who often do not enjoy the latest technologies in applications and automation systems because they do not have their needs covered by these technologies.
 - Some simple solutions are very expensive or hard to implement, then, part of the society has no access for money issues;
- This work has as a great objective develop an autonomous system that increase the level of inclusion of PNEs.
- The other objectives is reducing the cost of the solution, using open hardware and free software, in order to guarantee a system that can also be accessed by PNEs of disadvantaged social groups

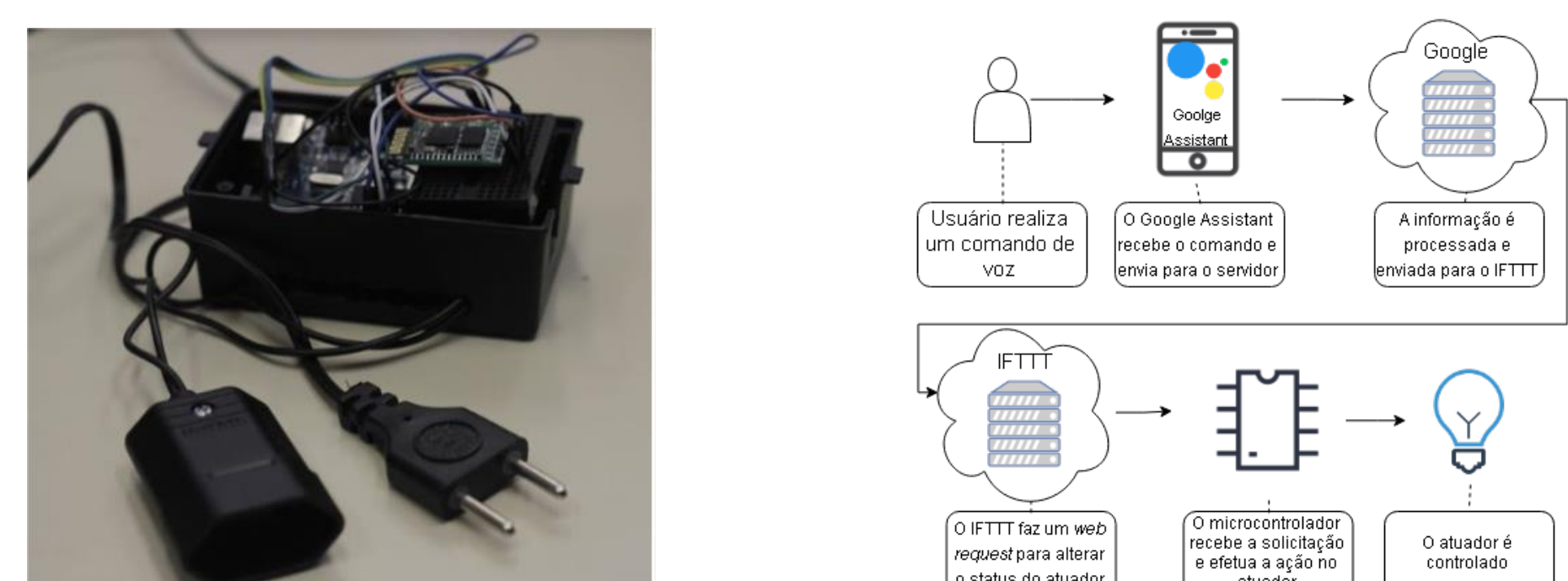
Models Implementation

Two main blocks were developed for this project:

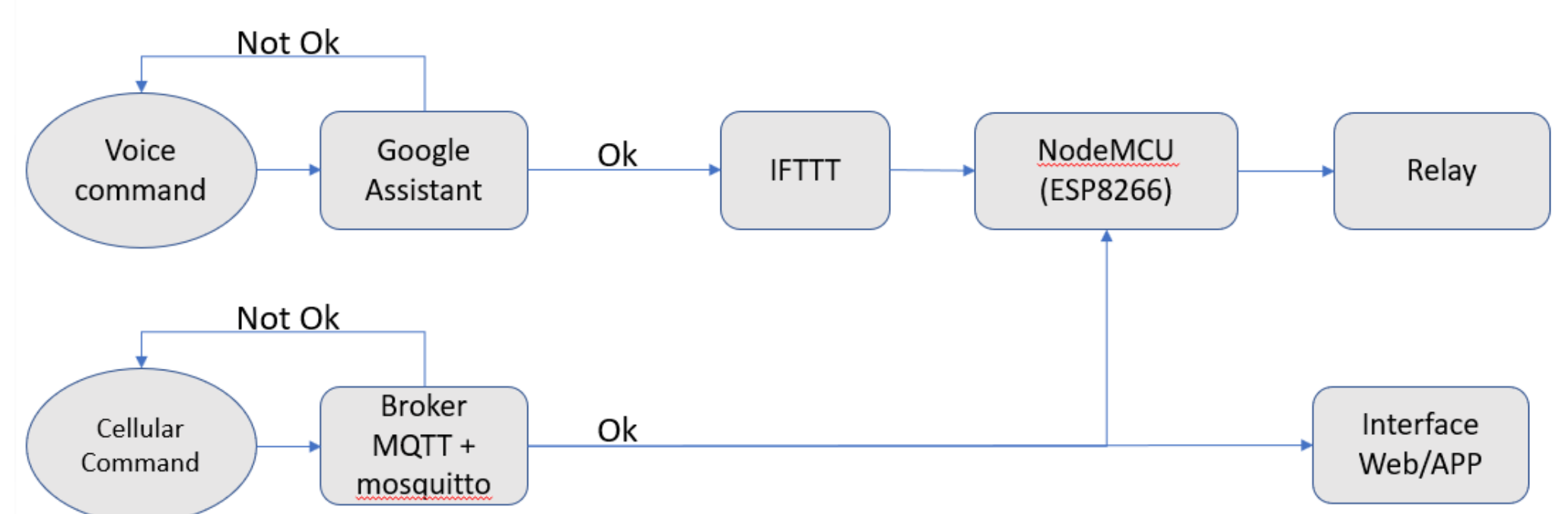
- **Access Control System (ACS) :**
 - utilizes the RFID technology (13,56 MHz). This frequency was the choose one because it is very cheap and is also used in most city transport system;
 - The main board is an *arduino uno* board, used as a platform for the RFID system;
 - The ACS system also have an actuator for the door. This one is composed of DC motors and a H-bridge and, when the access is permitted, opens or close the door, automatically;
 - The actuator is designed to open or close a door that moves on a fixed point, not a sliding one, being more useful for home applications;

Power-Up Control System (PUCS) :

- This system is a two-way control of energy source for almost any device; Using voice command or Bluetooth (using cellphone), it is possible to turn on or off a connected device;
- The voice control is developed using *Google Assistant*, a free tool powered by *Google*;
- This system is implemented in a Raspberry Pi 3. Using this board, we were able to reduce the cost of use a *Google Home* board, with same functionalities;
- A *NodeMcu ESP 8266* and a relay module are responsible for the power control;
- The protocol for communication between google assistant and *NodeMcu* is the *IFTTT*;
- For the Bluetooth version, an *MQTT* broker was implemented for sending messages to the *NodeMcu*;



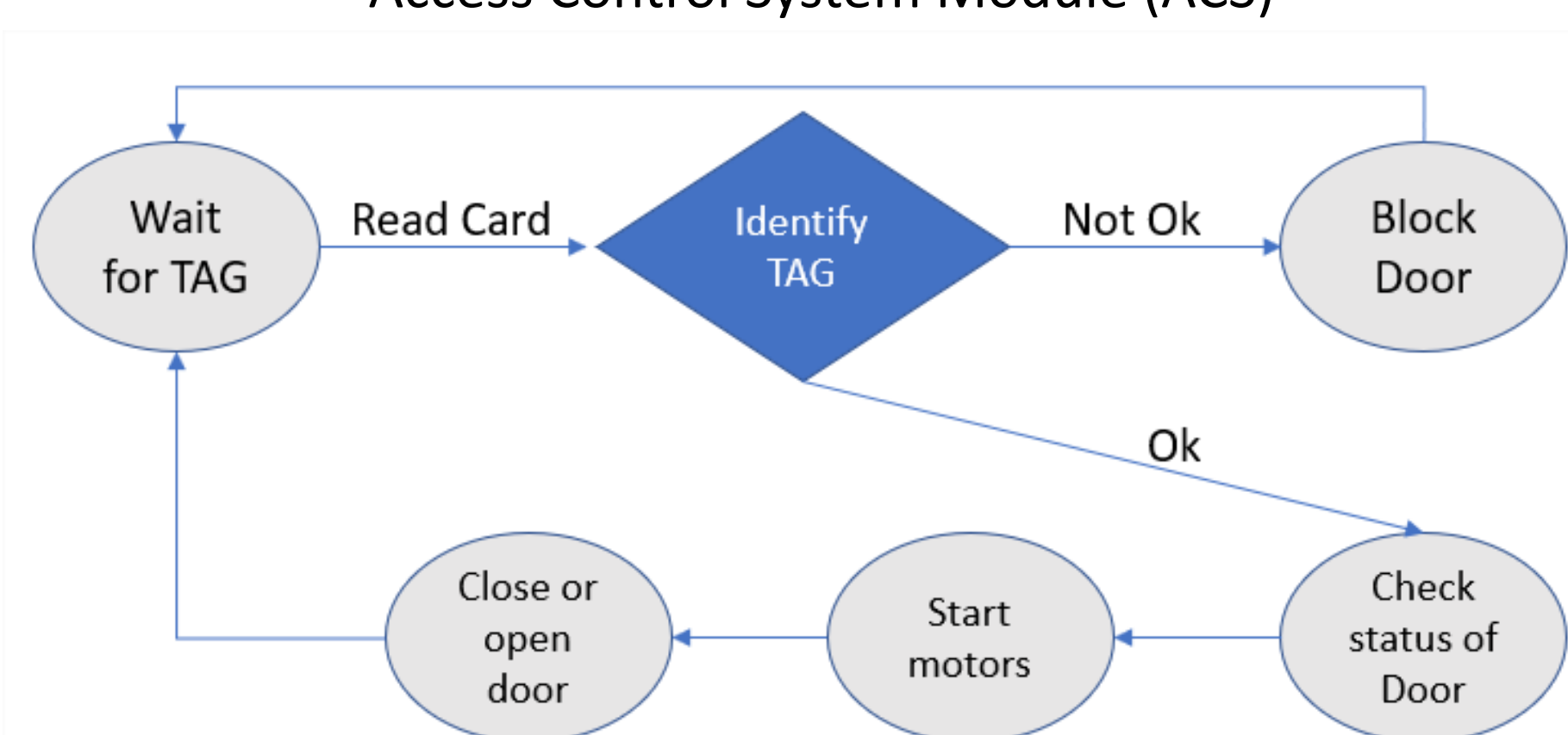
Power-UP Control System Module (PUCS)



PUCS Google assistant Fluxogram



Access Control System Module (ACS)



ACS algorithm

Concluding Remarks

1. The work was developed with a low cost experience;
2. All the implemented methods are free or open source;
3. The final models were installed in dependencies of Instituto Federal de Goiás – Brazil in some rooms for testing;
4. The authors aim to continue this project with more sensors and with a server to record and analyze the data for some Artificial Intelligence application.

References

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