Embedded Software portfolio

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Insides on Embedded software

In embedded software there's an empirical rule that comes from electronics engineering:

"(almost) Nothing works in the first try"

This and the sum of systems with less resources that reduce debugging capabilities, or less communities (StackOverflow or similars won't have the answers) makes it a challenging task.

To be good on embedded software, creativity is needed to debug boards in new ways, discipline is needed to patiently read the user manuals and application notes, where almost always the answers are found, and also have the experience to search bugs not only on the software, but in the hardware, or external conditions like temperature affecting a sensor functionality, a close-by motor or equipment that generates electromagnetic interference on a certain component.

All that aspects are always on my mind and makes me start new projects with discipline, determination, knowing that a bug could cause me headaches but always with the persistence to face it and solve it.

And also, making things work is my passion, another skill that ensures the success of the projects I'm in!

Related skills

- C programming
  - Library creation
  - Pointers
  - Encapsulating variables for optimizing space
  - State machines
  - "Multitasking" programming without the need of an RTOS (for low footprint microcontrollers)
  - C in embedded linux environments
- RTOS
- Microcontroller programming with libraries (for example ASF from Atmel)
- Microcontroller programming at low level (c with register manipulation)
- Embedded linux
- Python
  - In embedded linux environments
  - In normal computers and servers environments

Relevant studies

RTOS

A theoretical-practical class about deep understanding RTOS, characteristics, restrictions, pros and cons, various RTOS systems and projects to apply the concepts

Master class at Universidad Javeriana, Bogotá - 2017

Software for processors

A project oriented class introducing advanced concepts of processor programming in c, and being able to "multitask" without having an RTOS. Also strengthen concepts of pointers and advanced c techniques.

Master class at Universidad Javeriana, Bogotá - 2016

Embedded systems

A project oriented class focused on the used of embedded linux usage for IoT applications

Master class at Universidad Javeriana, Bogotá - 2016

Embedded systems for IoT

A course introducing basic concepts on embedded programming with linux, using Intel's platforms like Galileo and Edison.

Short course by U. Javeriana and Intel, Bogotá - 2015

Introduction to IoT

A course introducing basic IoT concepts, and the potential of IoT industry in the next years

Short course by U. Javeriana and Intel, Bogotá - 2015

Embedded systems

Understanding how embedded linux works, advantages, restrictions and basic introduction on how to port it to new hardware

Master at Universidad de los Andes, Bogotá - 2012

Architecture of digital systems

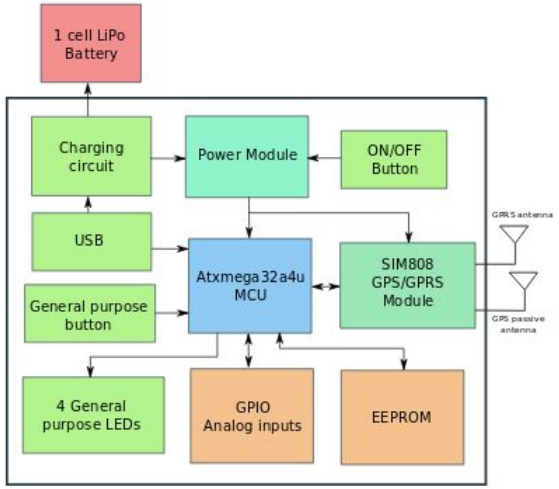
A project oriented class, with 4 projects with real life requirements where I learned assembler and C.

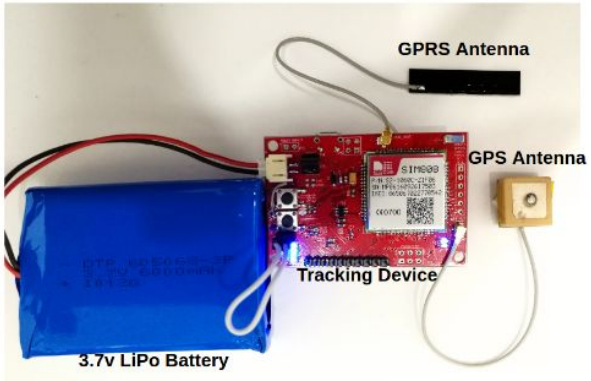
Undergraduate class at Universidad de los Andes, Bogotá - 2010

Project samples

Design and implementation of Electronic Seal for container tracking

- Design proposal
- Component prototyping to see viability
- Hardware design and hand soldering of prototypes
- Programming in C using "multitasking" without RTOS.
    - State machine programming for MQTT communication.
    - Hardware and software programming on the power on button, so it can only be manipulated on certain places or with authorizations (can be turn on everywhere, but only turn off at the destiny or with authorization message received by mqtt.
    - Hardware and software design for low consumption (17 days goal)





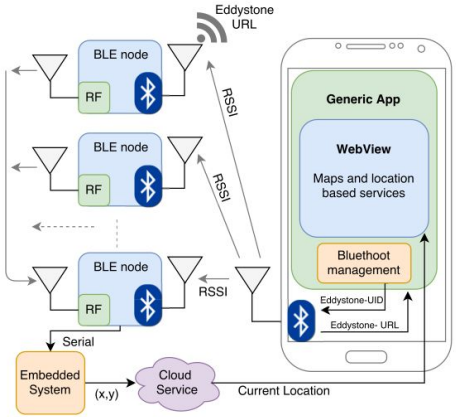


Figure 4.1: Detailed architecture of the system.

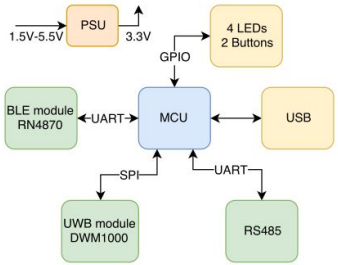


Figure 4.2: Block diagram of the OnePos Board.

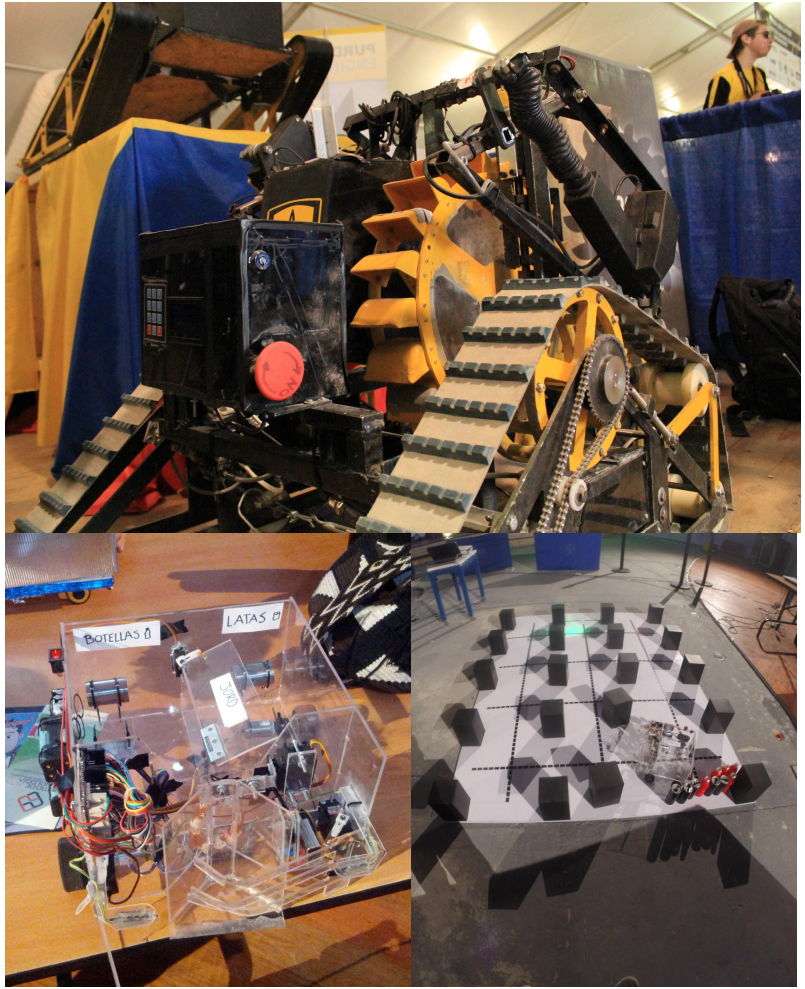
Frictionless indoor location using BLE, and UltraWideBand for system calibration (Master's project)

- System proposal and architecture
- Design and implementation of hardware, embedded software of BLE node and system hub, cloud and basic webpage
- Programming in C using "multitasking" approach.
  - Ble and UWB libraries ported for selected microcontroller (ATxmega32A4U).
  - Software ble filter to recognize only desired smartphone and communicate only into desire network
  - Programmable roles of devices (common nodes or main node). This configuration could be done with a terminal and a virtualCOM using device USB

Robotics

Robotics has been always a passion for me. That allowed me to win several prices and increase my abilities in hardware and embedded software design, Some examples of the 5 contests i've participated are:

- Top picture: Part of U. de los Andes' Robocol team, 4th place at NASA's 2013 lunabotics mining competition
  - In charge of embedded software and command center communication using wifi
  - Design of user menu controlled with an LCD screen and a keypad for testing, configuration and manual activation of some components of the robot.
- Bottom pictures: Jord Robot. 1th place at 2016 Runibot competition, in the category of social robots. Robot had to pick cans and plastic bottles, and classify them.
  - Had to ideate a way to differentiate plastic from aluminium
  - Configured the bootloader of the microcontroller so it could be programmed wireless with bluetooth and optimized the testing process.



https://www.youtube.com/watch?v=EpmEDp3D9tI&t=77s

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