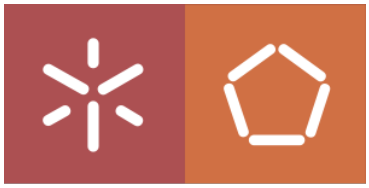

Universidade do Minho
Escola de Engenharia

Master's in Industrial Electronics and Computers Engineering

University of Minho

5S Drifter

Sensoring System for Surface Sea Streams

Integrative Project in Industrial Electronics and Computers

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Chapter 1

Project Plan

This chapter will briefly talk about the 5S Drifter project motivations as well their function as a product developed by the Minho's University

1.1 Introduction

Under the course unity of Integrative Project in Industrial Electronics and Computers the students must apply for professors projects in order to integrate unde their respective laboratories and start to undertand the pace demanded on the Master's final paper.

This project is given by the professor Luis Gonçalves and Sergio Lopes unde the CMEMS laboratory has the main porpouse to create a drifter for data aquisition. As a multi-themed project, this report will explore multiple areas, as the PCB design for hardware and firmware manufacture, software design under the idea to optimize the execution allowing for better performance. The main goal is to have the final product afloat at the end of the simester.

1.1.1 Problem Statement

The ocean is one of the man greatest mistery even before the written history. Humanity made the world ours over the water, from the Portuguese greatests discoveries, braving the raging ocean to the newst oil tanker demanding ever newer technology in order to tame the sea for safer and smother sailing.

Nowadays cientists belive only 5% of the ocean is discovered with the actual technology witch means that humanity know as much about our so grate sky as our own seas. 5S ocean drifter is a equipament made to acquire date from superficial sea streams and expand the oceangrapgh knowledge about it.

Here a listed examples where the 5S data has practical use.
economy
ecology
sports

1.1.2 Problem Statement Analysis

Chapter 2

Analysis

2.1 Requirements and Constraints

2.1.1 Requirements

- Search and selection of hardware components.
- Software design.
- PCB design.
- 5S 3D design.
- Actual product realization.
- Laboratory tests.

2.1.2 Constraints

- The firmware of the STM32 is allready set.
- The project must be presented for avaluation within deadline.
- The project has to be valitated at the ocean.

2.2 State of the art

2.2.1 Economy

2.2.2 Ecology

2.2.3 Sports

2.3 Market Research

2.4 System Architecture

Chapter 3

Design

3.1 Analysis Review

3.2 Hardware Specification

3.2.1 STM32

microcontroler

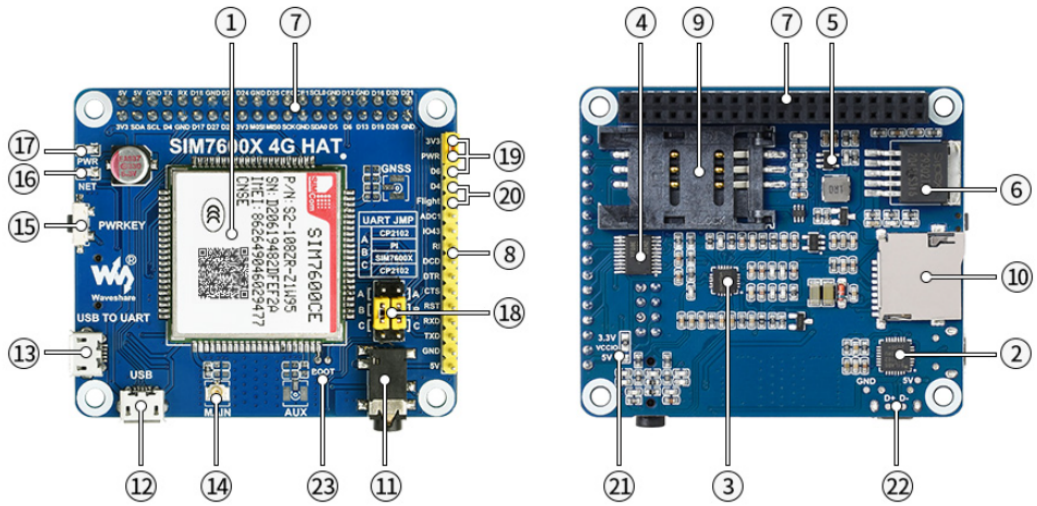
3.2.2 BMI088 IMU Sensor

gyroscope and acelerometer

3.2.3 SIM7600E-H

The module SIM7600E-H, developed by SIMCom, is a 4G/3G/2G LTE module that comunicates via UART commads using an intern parser described on the module datasheet. The waveshare Board with the module, comes with a set of extra functionalities for extra support to the module normal usage.

The following image, taken from the Waveshare board datasheet, lists the hardware features.



1. SIM7600CE-CNSE
2. CP2102 USB to UART converter
3. NAU8810 audio decoder
4. TXS0108EPWR voltage translator
   - translates 3.3V/5V into 1.8V
5. MP2128DT power chip
6. SPX29302 power chip
7. Raspberry Pi GPIO header
   - for connecting with Raspberry Pi
8. SIM7600 control interface
   - for connecting with host boards like Arduino/STM32
9. SIM card slot
   - supports 1.8V/3V SIM card
10. TF card slot
    - for storing data like files, messages, etc.
11. 3.5mm earphone/mic jack
    - for audio actions like making telephone call
12. USB interface
    - for testing AT Commands, and so on
13. USB TO UART interface
    - for serial debugging, or login to Raspberry Pi
14. MAIN antenna connector
15. Module power switch
16. Network status indicator
17. Power indicator
18. UART selection jumper
    - A: access Raspberry Pi via USB to UART
    - B: control the SIM7600 by Raspberry Pi
    - C: control the SIM7600 via USB to UART
19. PWR selection jumper
    - PWR - 3V3: auto startup on power-up
    - PWR - D6: startup/shutdown by the Raspberry Pi D6 pin
20. Flight mode selection jumper
    - NC by default, no flight mode control pin
    - Flight - D4: flight mode is controlled by the Raspberry Pi D4 pin
21. Operating voltage selection jumper
    - VCCIO - 3.3V: set operating voltage as 3.3V
    - VCCIO - 5V: set operating voltage as 5V
22. USB connector solder pads
23. BOOT forced programming solder pads

Figure 3.1: SIM7600 datasheet

The hardware configurations, as idicated on the datasheet should follow the leading steps.

As for the UART communication, the list of commads are listed on the datasheet. As for better flow, here are listed the commadsused along the project and their functionalities.

3.3 Tools and COTS

3.3.1 Tools

3.3.2 COTS

GPS and 4G module

Inkscape

draw.io

STM32 CUBEmx

LaTeX

3.4 Software Specification

3.5 Theorical Concepts

Chapter 4

Implementation

4.1 Hardware

4.2 Software

4.2.1 DataBase Comunication

Chapter 5

Conclusion

5.1 Gantt Diagram

5.2 Bibliografy