Methods and tools for software quality

Introduction

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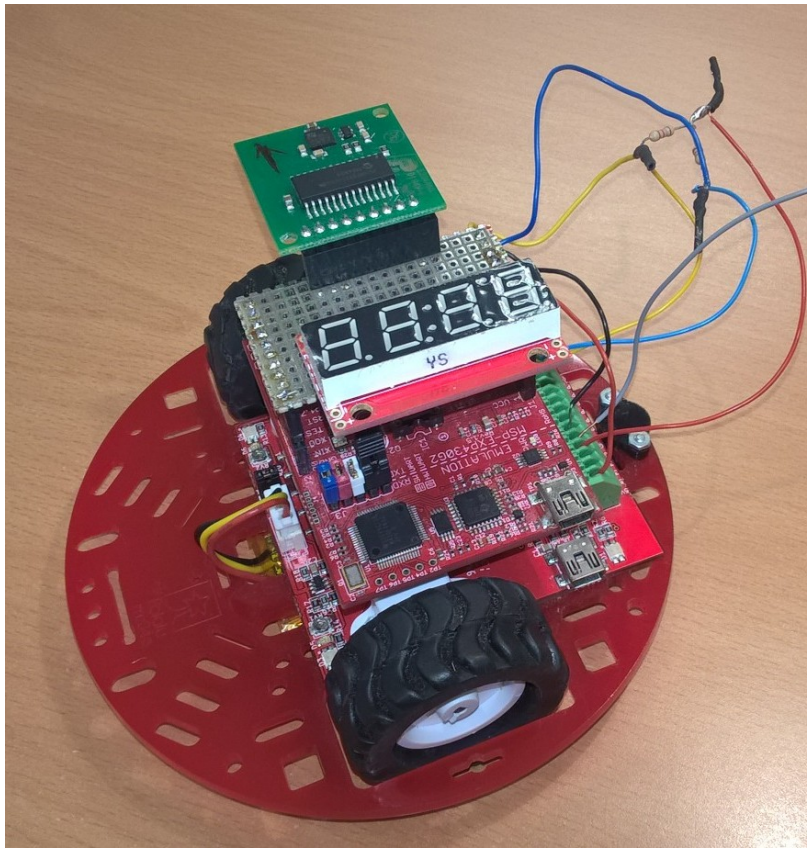
Introduction

- The goal of this part of the course is to develop an embedded system.
- This embedded system is a mobile robot.
- The robot is controlled by a MSP430g2553 microcontroller.
- Some libraries are available.
- Students will develop:
  - High level functions to create paths..
  - Always with high degree of modularity.

Introduction

- Picture of the robot.

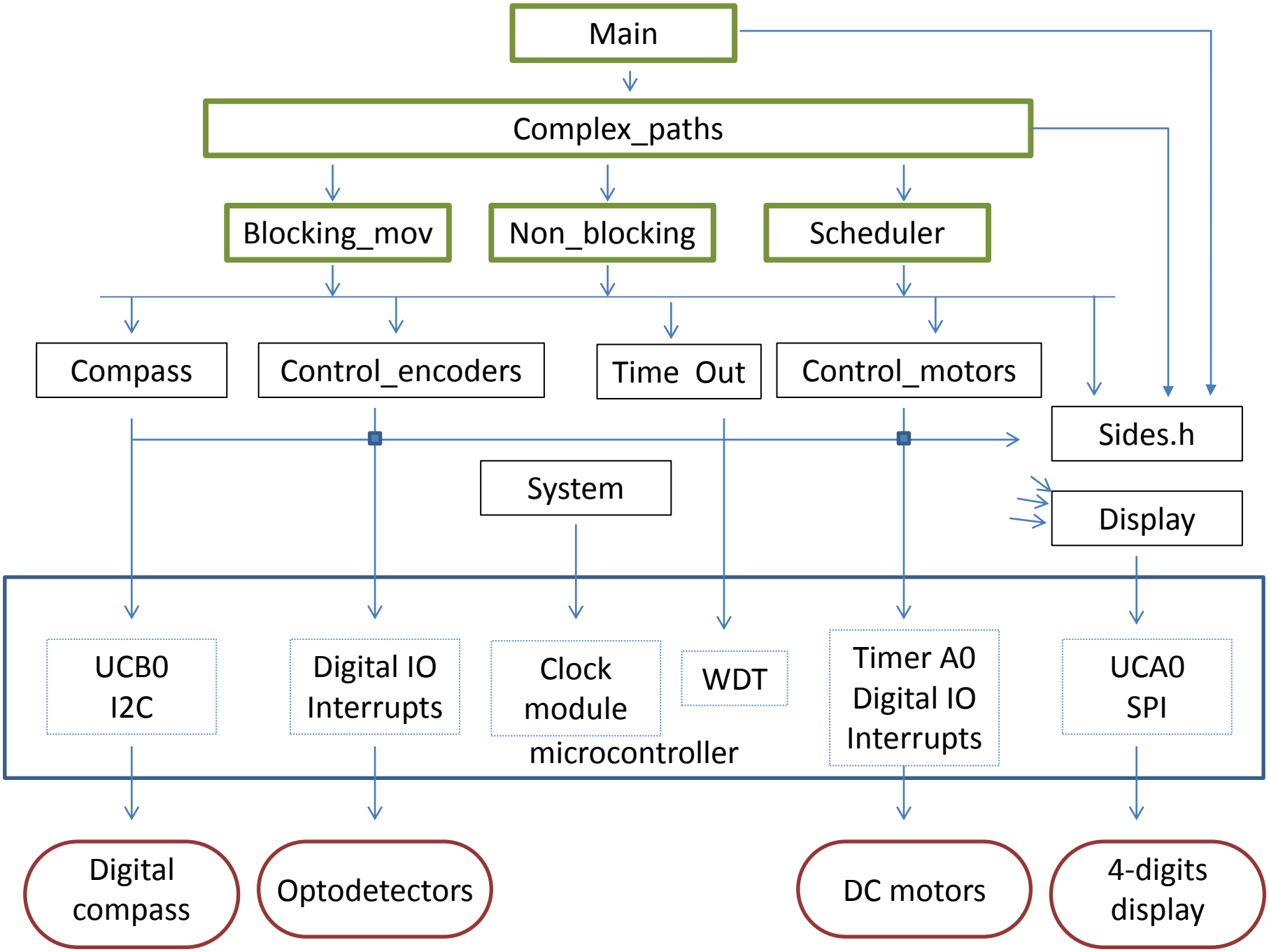


Introduction

- Components of the robot:
  - Two DC motors. They are controlled by PWM (Pulse Width Modulation).
  - Two optoelectronic sensors attached to the wheels. They allow to measure distance.
  - Digital compass connected by I2C (Inter-Integrated circuit).
  - 7-segments display of 4 digits connected by SPI (Serial Peripheral Interface).
  - MSP430G2553 microcontroller.

System architecture

- Next slide shows the system architecture, both hardware and software.
- At the bottom, in red, the external peripherals.
- Then, in blue box, the microcontroller with internal peripherals used to control/communicate with external peripherals
- Over the microcontroller, in black, some libraries available to use them. Each module includes a **.c** and **.h** files (but sides.h)
- At top level, in green, modules to be developed by students.


Main
Complex_paths
Blocking_mov
Non_blocking
Scheduler
Compass
Control_encoders
Time Out
Control_motors
Sides.h
System
Display
UCB0
I2C
Digital IO
Interrupts
Clock
module
WDT
Timer A0
Digital IO
Interrupts
UCA0
SPI
microcontroller
Digital
compass
Optodetectors
DC motors
4-digits
display

System architecture

- First exercises will devoted to check the proper operation of hardware, by means of provided libraries.
  - Detail of the software library is available in document *Library_architecture.pdf*
- Next exercises are devoted to create high-level functions for control of robot movement.

Software architecture

- One library with several modules.
- Description of modules in document *Library_architecture.pdf*
- Structure of the document:
  - Name and purpose of the module.
  - Name of the header to be included.
  - Constants and prototypes of functions.
  - Examples of use.
  - Other considerations.

Plan for project development

- Development of the project is divided into steps. Each step has its own document
- Step 1: preparing software.
  - Starting_ccs.pdf
- Step 2: testing the hardware.
  - Testing_hardware.pdf
- Step 3: developing movements
  - Straight, spin, turn…
  - Using encoders (distance) and compass (course).
  - Both blocking and non-blocking functions.

Plan for project development

- Choose your favorite:
  - Developing complex movements.
    - Complex structure to store a list of movements.
  - Straight bearing-based movement.
    - An auto-correcting straight movement.
  - Add low power modes.
    - To non-blocking movements.
  - Add functions to the library.
    - For example, measuring speed.

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