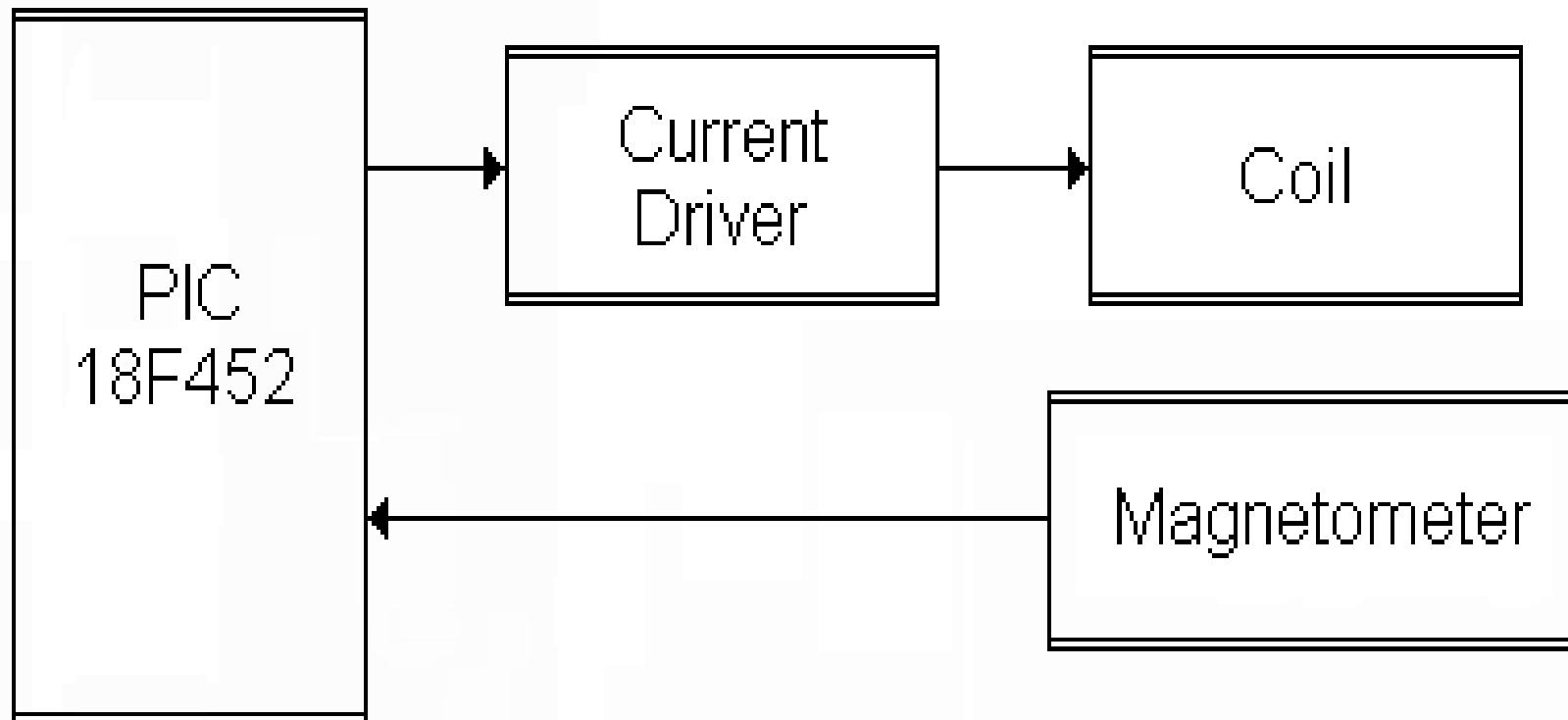


AtmoCube System

Actuator control system using PIC18F452

Lucchesi Davide

Simple Block Diagram of the system



Magnetometer HMC2003

- Input range: -2 / +2 Gauss
- Output range: 0,5 / 4,5 V

Average value = 2,5 V

- Voltage reference for the analog/digital acquisition

Voltage values = 0 and 5 V

Coil

the magnetic actuator

- Square coil with side $L=8,5$ cm
- Number of windings $N=156$
of copper wire
- Value of the current $I=500$ mA

Dipole magnetic momentum generated

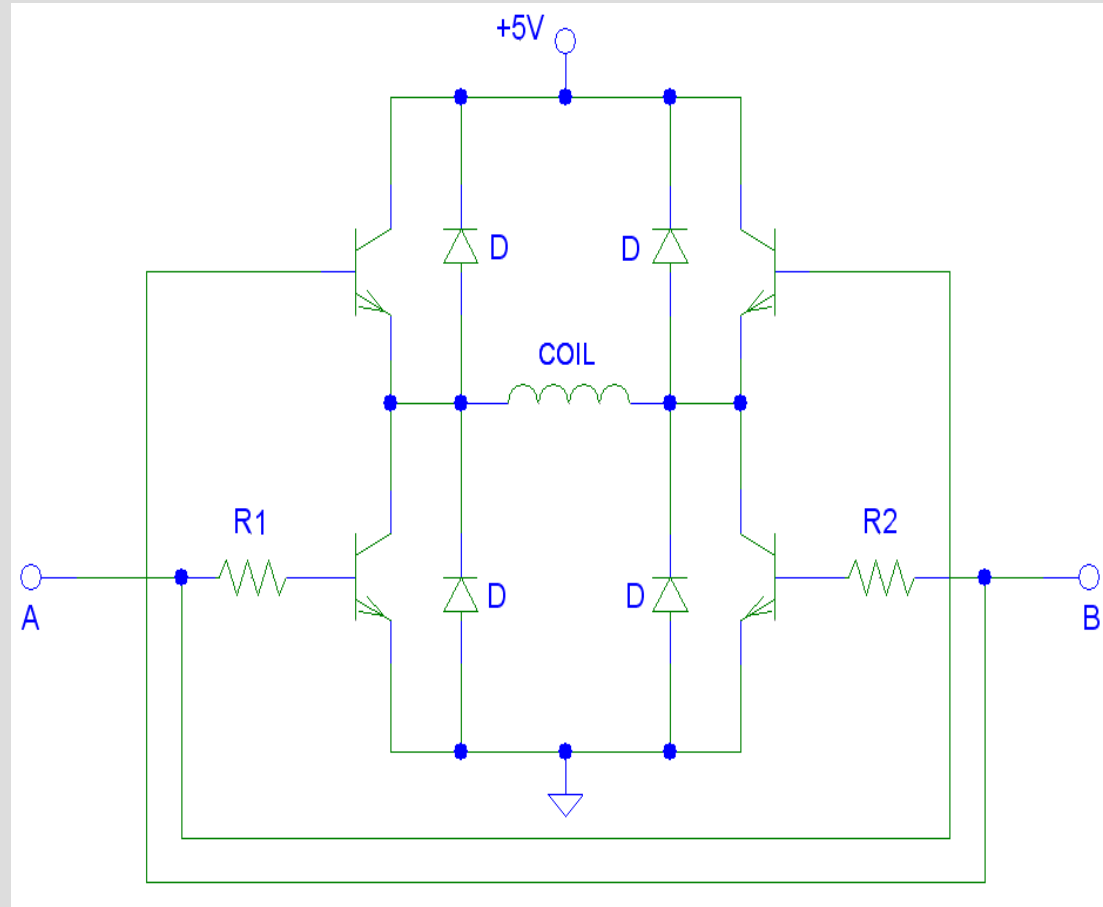
$$|M|=0,56 \text{ A}\cdot\text{m}^2$$

Current driver

H-bridge or Full bridge with transistor

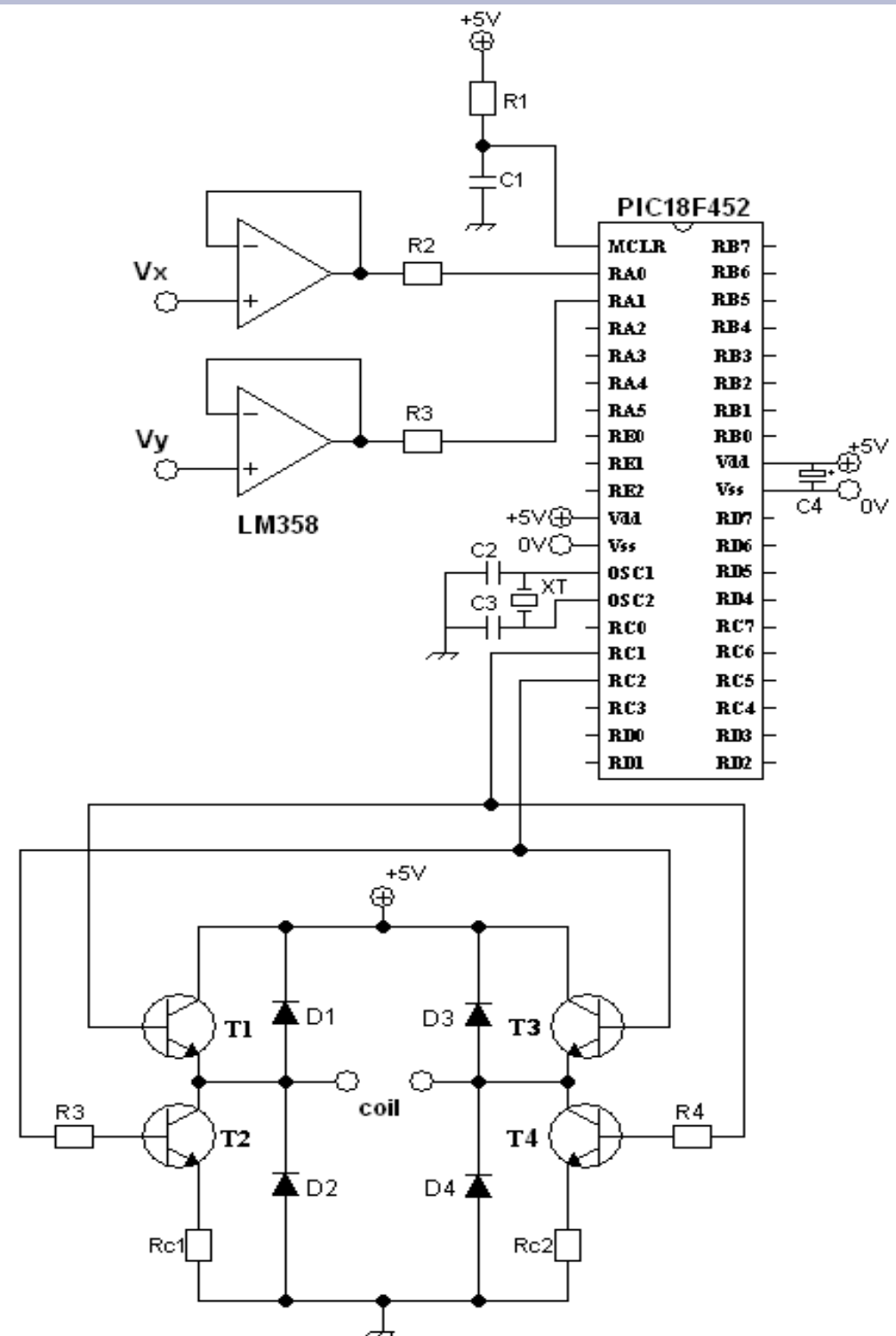
The configuration of the input are:

- AB=00 no current
- AB=01 current in one way
- AB=10 current in the other way



Complete circuit

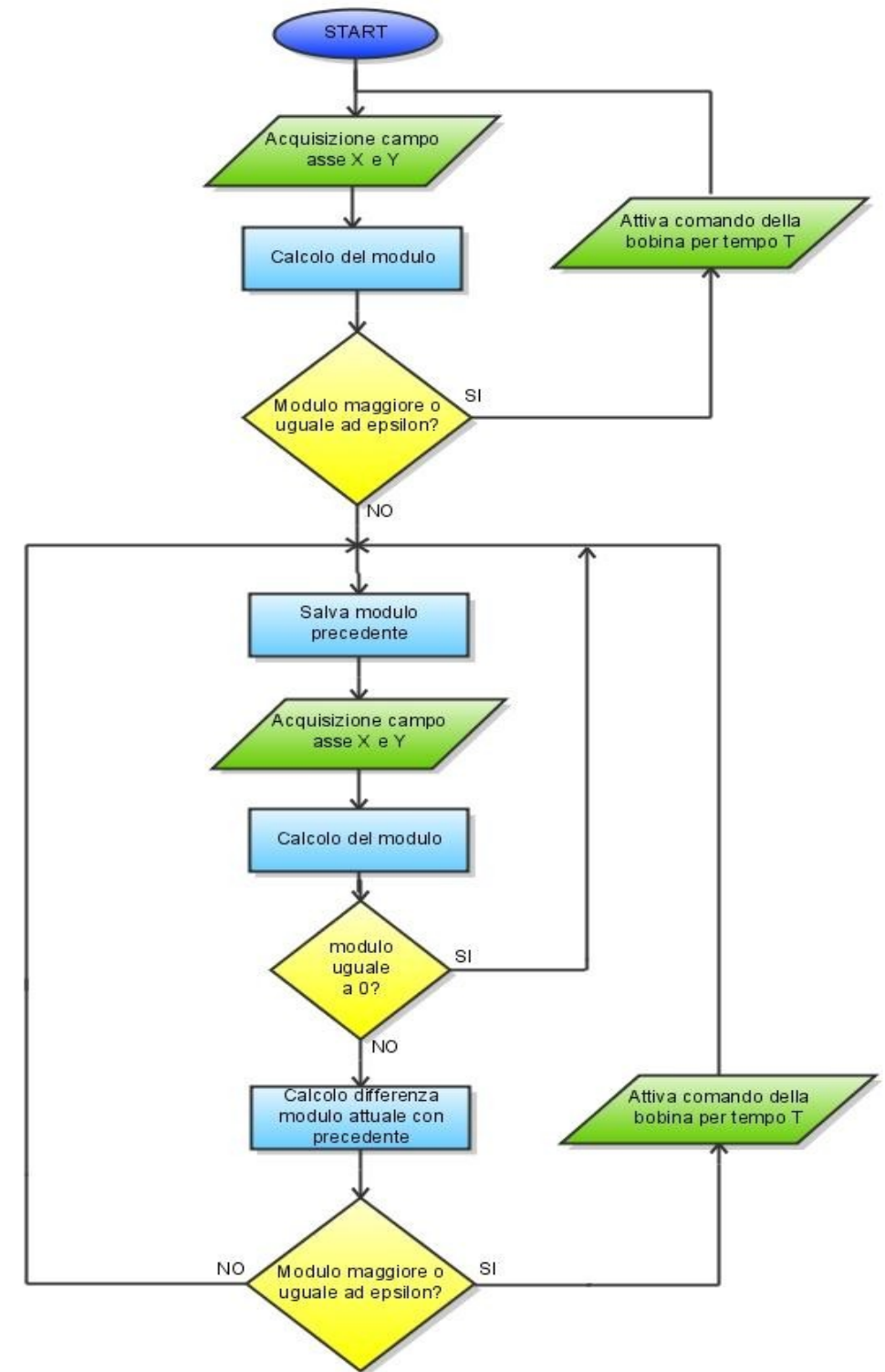
- PIC alimentation voltage 0 – 5 V
- Quartz oscillator
 $f = 4\text{M Hz}$
- Two input buffer for X and Y voltage
- Diodes D1 – D2 protect the transistors from overvoltage



Control strategy

The program is structured in 2 parts:

- Check if the module of the X and Y axis is bigger than epsilon:
 - If yes, active the coil and continue the first cycle;
 - If not, don't active the coil and go on;
- Check if the module calculated for two consecutive time is bigger or equal to 0:
 - If yes, active the coil and continue the second cycle;
 - If not, don't active the coil;



PIC program

- Write with Assembly language
- Compiled with MPLab 8.10
- Debugged with Mpsim
- Programmed with the PIC START Plus

Future of the project

- Needs to create a START and STOP command for the program
- Study a new type of magnetic actuator. Not a copper wire coil but a multistrated printed wiring board (PWB)
- Put together the actuator control circuit with the other parts of the AtmoCube satellite system