First Assignement

THE LEGO MOTOR SYSTEM ANALYSIS

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Chapter 1

INTRODUCTION

The system for both the data acquisition and data processing is composed of a Lego Mindstorm and linux o.s. pc. The code language for the brick to be programmed is the c, which is a well known language and permits to the developer a simple debugging process.
Once the program has been compiled and uploaded on the brick (instruction on nxtOSEK website), some steps are needed for the data to be transferred.

- launch the BROFist file with the command '-l', this in order to get the bluetooth identification key of the brick;
- launch the BROFist file with the command '-m' followed by the bluetooth key gets at the previous step, this let the bluetooth data transfer from the brick to the pc (and viceversa) possible;
- select the 'BROclient' program and run it by pressing the run button;

While the program is running, on the brick monitor is shown information about the software status:

- name and release of the program;
- running phase: every 5 second the motor velocity changes (interval from -100 to 100), this permits to get data from a vast range of velocity;
- motor status: information about the motor movement, whether it is running or is not;

The program stops at any time if the ENTER button (that orange) is pressed; this stop the program by invoking the TaskTerminate() method.

Chapter 2

DATA ACQUISITION

2.1 Lego motor (com'e, caratteristiche, approccio)...

So far we have focused our work on the reliability and quality of the bluetooth data transferring. It is a well-known fact that the Lego brick is affected of a delay problems and this makes difficult to receive good data from it.
We solved the problem by making the data buffer unidirectional; in other words once our program has been started it stars to send the data to the pc.
This permits:

- a very high reading frequency: (500 hz),
- high reliability, since the code is integrated directly into the system developed by Michele Bianchi,
- a control over the data flow, that permits to manage the inconsistent and redundancy data.

Our program need of the following components in order to work:

- LEGO MINDSTORMS NXT Brick;
- LEGO MINDSTORMS NXT Interactive Motor;
- Our software, included into the brofist directory;

In particular the LEGO MINDSTORMS is an interactive motor what works a 9V with internal gears (overall gear ratio 1:48) that has also an embedded rotation encoder with a resolution of 1?. From this motor it is possible to set two kind of data:

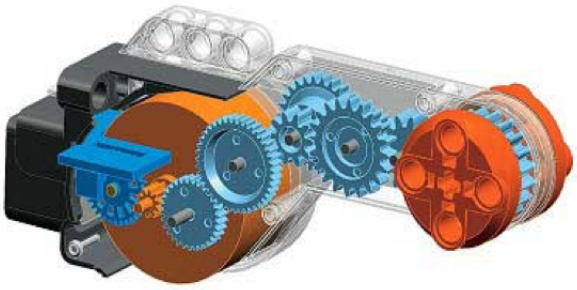
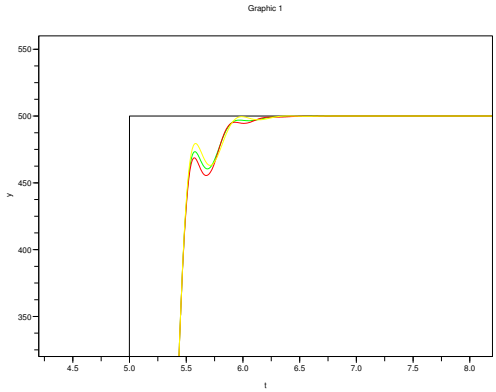


Figure 2.1: Picture 1.1. The Lego Motor

- Servo Motor revolution count in degree, by setting a positive or negative value it is possible to make the motor run either in a clockwise or not way.
- Servo Motor PWM value and brake mode, this value regards the velocity percentage of the motor (if set to zero stops it);

2.2 Signal applied to the motor (freq, qualita campioni, grafici . . .)



2.3 System response frequency. . .

2.4 Challenges and problems. . .

Chapter 3

DATA ANALYSIS...

3.1 Signal quality (com'era? eventuali adjustements?)...

3.2 Step response analysis (steady value, rise time etc....

Chapter 4

DATA ESTIMATIONS

4.1 Second order system approximation (dumping factor and sampling frequency)...

4.2 Data comparison (fra misurato e reale, grafici++)...

4.3 Frequency response analisys (to a sinusoidal signal)...

Bibliography

[1] Palopoli website `http://www.lorenzopantieri.net/LaTeX_files/ArteLaTeX.pdf`.