Course project : Light sensitive robot

Description

The project is to create a robot able to adapt his behavior considering the amount of light send to it. This project will be used as a support for the electronic course in December.

The robot must be able to move using the 2 DC motors, motors controlled from an H-bridge manually made by you. It must have 1 photoresistor in front and 1 on each sides. I will use a pocket light to control it (means that he has to take into account the ambient light). The robot must be coded in AVR-C using the ATmega 328. All electric board must be done with pierced board *(cabinet A3, Prototype step)*, no SMD allowed, no breadboard allowed for circuit (on the final product, you can use breadboard to create you circuit).

Resources

To do this project, you will have the obligation to use the following material :

- 1 ATmega328 *(cabinet A2, Logical circuit step)*
- 2 DC motors working in 5V *(already given)*
- 3 photoresistors *(cabinet A3, Sensors step)*
- 1 9v battery *(Cabinet A1, Battery step)*

You can choose what you want to use for all the remaining materials. If you need to order material, contact me. The shipping delay must be considered, **you will not have any time extension because you ordered your material too late.**

Power board

As your DC motors and ATmega328 work with 5V, you will need to convert your 9V DC in a 5V DC. To do so, I advise you to create a separate board with a circuit for linear converter. The most simple and easy to use linear converter we have is the LM78xx. It is a component who convert any voltage entry to a fixed voltage output, this fixed voltage is the xx in the name. For example, a LM7805 convert any voltage input as a 5V output. *(Little tips, the LM is the manufacturer name, the real name of the component is 78xx. If you find a component with the 78xx but another set of letter than LM before, it's the same component but made by another manufacturer)*

I encourage you to read the datasheet to know the minimum circuit to protect your converter. *Our LM78xx can be find in the cabinet A2, NP components step.*

H bridge

An H-bridge is a circuit who can reverse the voltage going through a component. It's extremely use to drive a DC motors. As I wish you to manipulate transistors and do some circuits, I want you to create your own H-bridge using transistors. I will have a special attention to the circuit protection, take care. *You can find all our transistors an the cabinet A2, NP components step*

ATmega328

You will have to use an ATmega328 to drive the motor considering the data from the photoresistors. **You must code in AVR-C your program.** You can use an arduino uno board as a programmer. If you do so, remember to leave **the board with his ATmega328, if I find a board without his ATmega, everyone lose 1 point on this project.**

The program must get the data from the photoresistors. If the value of the front one is higher than a threshold (you choose his value), the robot move forward. If the value of one on his side is higher than a threshold (you choose his value), the robot turn and face the light. If the robot is not excited by light, it doesn't move.

The ATmega328 need to have an external 16MHz to work, these crystals and the ATmega328 *can be found in the cabinet A2, Logical circuit step.*

I recommend you to use a tulipe support than soldering the ATmega directly. They are located close to the micro-controllers.

Notation

Concerning the notation, here is how you will be noted :

- **The Power board x/5 points.** 3 points if your voltage is correctly converted, 2 points if the board is correctly secured.
- **The H-bridge x/5 points.** 3 points if your voltage is correctly inverted, 2 points if the board is correctly secured.
- **The program x/5 points.** 3 points if it work as expected (movement and light detection, care you power and H-bridge work ;)). 2 points for code clarity.
- **The soldering x/5 points.** 3 points for the cleanliness of your soldering, 2 points for the PCB optimization.

A total of 20 points available. You do your project as you wish, remember that you will need it complete as a support for December.

Miscellaneous

I don't note the beauty of the robot or his mechanics. Nevertheless, I encourage you to make something clean, taking into account that it is destined to evolve.