LIGHT DETECTION

INTRODUCTION

Solar energy is an important renewable energy resource, so we built a robot capable to measure different light intensities from the planet. Why are we looking for great light intensity? For two reasons: on the one hand, we want to transform the robots we use on the planet into “solar robots” capable to act like a solar battery. So we create a robot capable to find a place with a huge solar energy and stay there until it is fully charged. One the other hand, if the planet will be colonized by humans, we want to see if we can find places on the planet with the same level of luminosity to which human eye is adapted.

OBJECTIVES

In this project, we will

- Build a robotic device to identify the place where light luminosity has the greatest level;
- Use the NXT to determine the magnetic induction level of the place where magnetic rock is placed;

MATERIALS

- computer
- 2 solar panels
- LEGO MINDSTORMS NXT Educational Set
- MINDSTORMS Edu NXT 2 software
- Vernier Light sensor
- Vernier NXT Sensor Adapter
- 2 (R=100 Ω) resistors
- light source (lamp and/or sunshine)
- Vernier Differential Voltage Probe

CONSTRUCTION

In our first experiment, we put on our robot a Vernier light sensor. The Vernier Light Sensor approximates the human eye in spectral response and can be used over different illumination ranges.

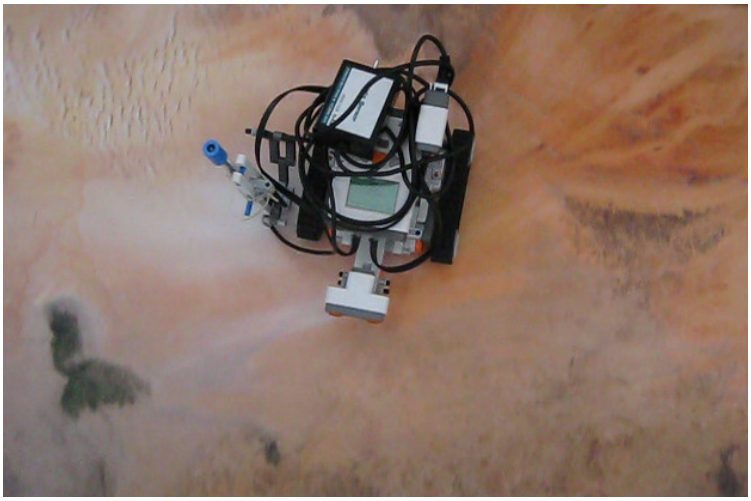

Figure 1 Light detector robot

This robot has the capability to find the place where light luminosity is bigger and adapted for human eyes.

In the second project, we build a rotating "solar tracker" able to follow the position of the sun. We use a Vernier Differential Voltage Probe and NXT to measure the voltage generated by a pair of solar cells. The robot is able to rotate 360° in both clockwise and counterclockwise directions so that the light source is always centered between the pair of solar cells. The "solar tracker" is able to operate from any starting position relative to the sun (light source). So, we want to use this device in order to orientate the solar photovoltaic panel, directly towards the sun, thus increasing the effectiveness of the panel. We want to use photovoltaic cells, or solar cells, in order to change the light energy created by the sun to electrical energy that can be used to machines, robots, or even satellites. We already know that photovoltaic cell works best if it is aimed directly at the sun. We observe that "our" sun's position varies, depending on the time of the day as it moves across the sky. A solar tracker is a device for orienting a solar photovoltaic panel directly toward the sun, thus increasing the effectiveness of the panel. In this project, your challenge is to build a robotic device to follow the position of the sun.

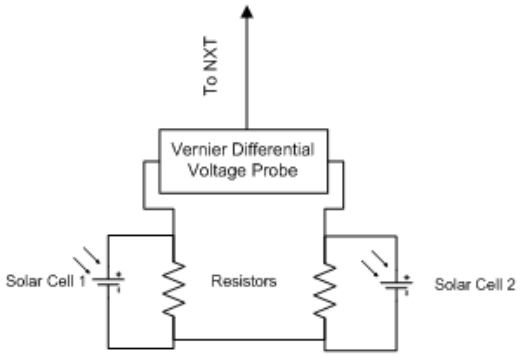

Figure 2 The "Solar traker"

The principle is relatively simple. With the Vernier Differential Voltage Probe wired as shown, the reading will be negative if one solar panel is getting the most light and positive if the other solar panel is getting the most light. We created a program consisting in solar cells rotation, which decides on the direction of rotation based on the voltage reading. Figure 3 illustrates the graph of differential voltage evolution in time, for both solar cells.

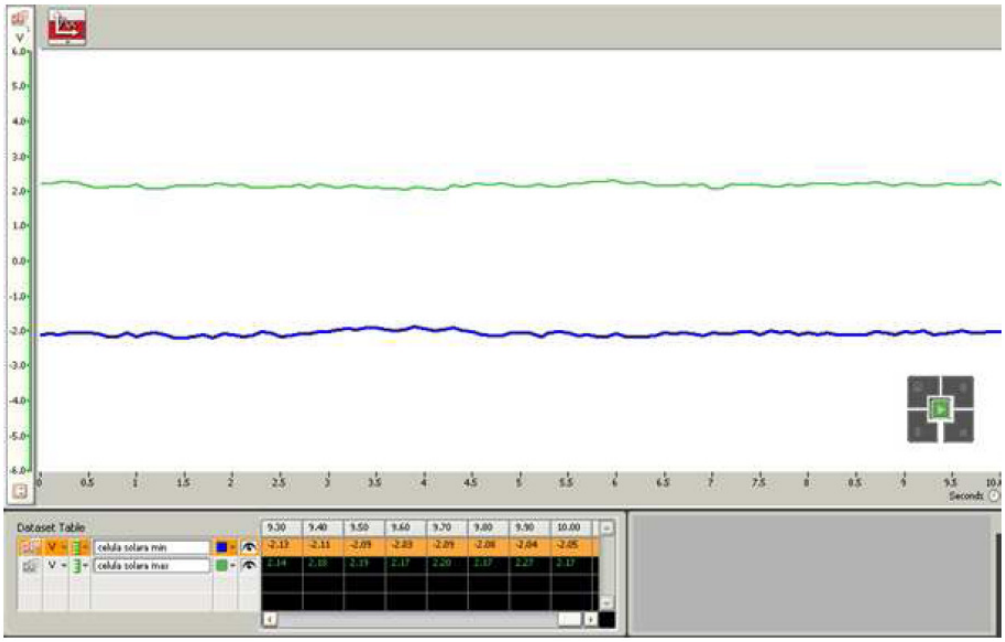

Figure 3 U = U(t) for solar cells