The Friendly Robot Tasks

Hello! Today our familiar robot has prepared some tasks for you. His name is Robot Link. He is kind, cheerful, and friendly. He really wants to be friends with people, but unfortunately, there are a few errors in his construction that prevent him from doing so.

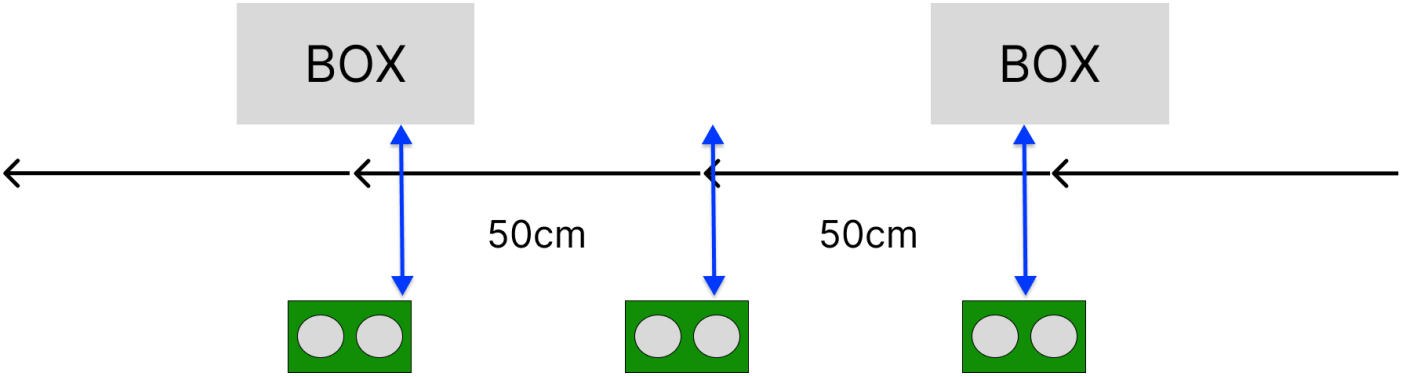
1) The first problem. Unfortunately, Link doesn't have a module that allows him to make sounds. And without that, it's difficult to talk to people. Your task now is to assemble a module that will play any melody of five notes when a button is pressed.

- **Provided:** Arduino microcontroller, piezoelectric element (speaker), button.
- **It is necessary to** assemble a device that plays a melody of 5 notes when the button is pressed.
- Evaluation criteria:
  - Scheme assembled correctly - 5 points
  - The device works - 5 points
  - The code is written correctly and beautifully - 5 points.

2) The second problem. Robot Link cannot feel temperature because he is not equipped with a temperature measurement module. He was very surprised to learn that people feel very cold at -20º Celsius and very hot at +20º Celsius. He asks you to assemble a device for measuring temperature. It is necessary to display the current temperature value on the screen and turn on the LEDs when it is very hot or very cold.

- **Provided:** Arduino microcontroller, red and blue LEDs, resistors, 16x2 LCD screen with I2C connection, temperature sensor.
- **It is necessary to** assemble a device for measuring temperature. The temperature value must be displayed on the screen with an accuracy of 0.1º Celsius. In addition to displaying the temperature, the red LED should be turned on if the temperature is above +20º Celsius, and the blue LED should be turned on if the temperature is below -20º Celsius.
- Evaluation criteria:
  - Scheme works - 3 points
  - Accuracy of assembly - 2 points
  - The current temperature value is displayed on the screen with an accuracy of 0.1º Celsius - 5 points
  - The blue LED turns on when the temperature value is below -20º Celsius and the red LED turns on when the temperature value is above +20º Celsius - 5 points
  - The code is written correctly and beautifully - 5 points.

3) Now Robot Link can live with people! And you know what? He was even offered a job at a factory assembling robots! They asked him to count the number of boxes with parts on the conveyor! This is a very difficult job for a robot, and Robot Link asks for your help again. The conveyor looks something like this picture.



The boxes move one by one from right to left, at a distance of 50 cm from the sensors. There are only 3 distance sensors. The box cannot appear or disappear in the middle of the conveyor.

- **Provided:** Arduino microcontroller, 3 ultrasonic distance sensors (shown in the picture above as a green rectangle with two circles inside), 16x2 LCD screen (I2C).
- **It is necessary to** assemble a device that displays the number of objects moving linearly on the conveyor from right to left. The count starts at zero when the device is turned on. The object should not be counted if it appears or disappears in the middle of the conveyor. The distance from the ultrasonic sensor to the object is from 40 to 60 centimeters.
- Evaluation criteria:
    - Scheme works - 3 points
    - Accuracy of assembly - 2 points
    - The code is written correctly and beautifully - 5 points
    - The device provides the following behavior: only the object moving from right to left from the first to the last sensor is counted as 1 box, and the updated number of boxes is displayed on the screen. - 10 points.