

Piezo Bot

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Introduction:

Our client, Dr. Carlo daCunha, challenged us to improve on the kilobot design, by using a piezo disk instead of a vibration motor. Supplying us with an AVR 8-bit MCU provided by Microchip.

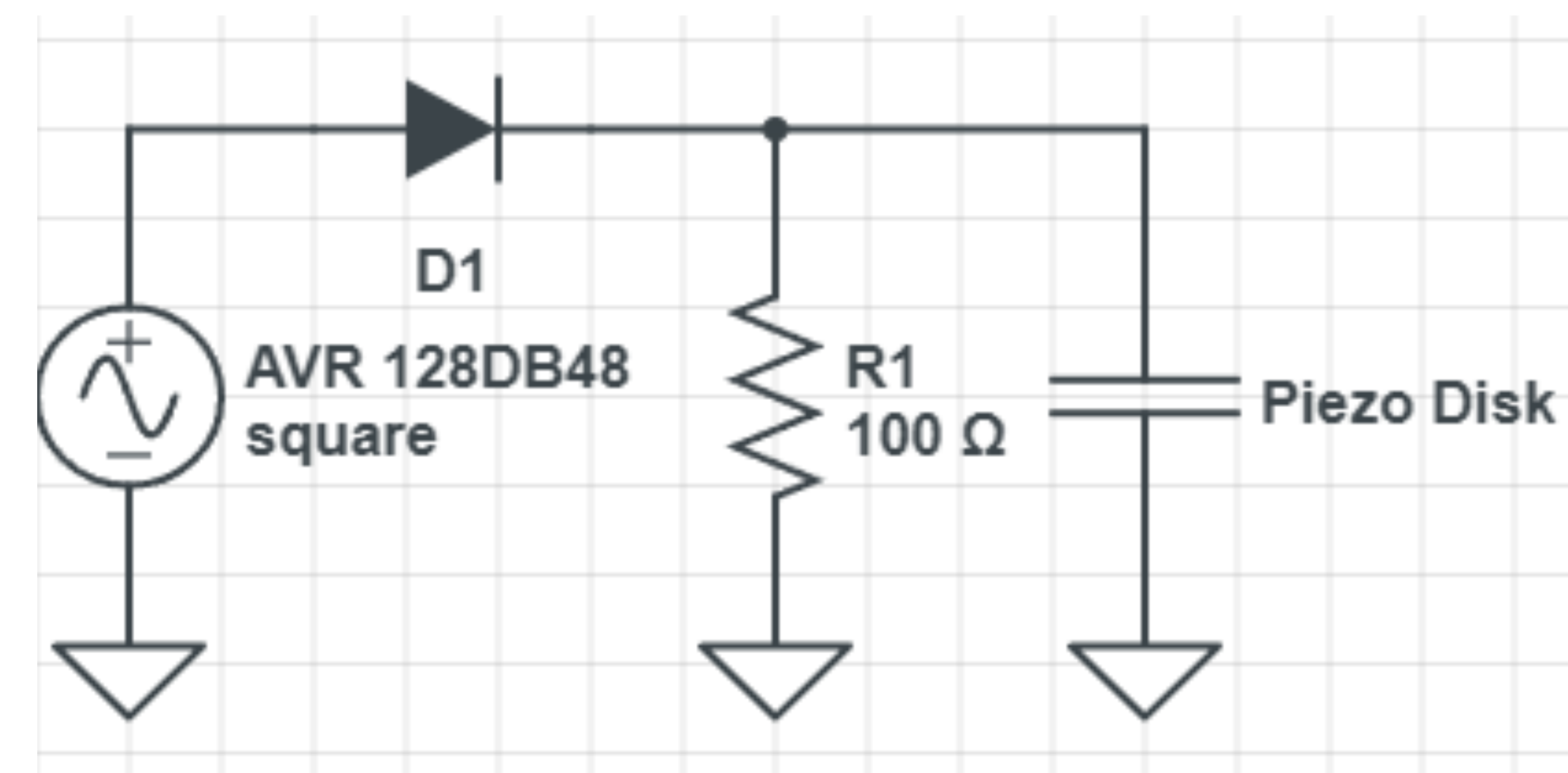
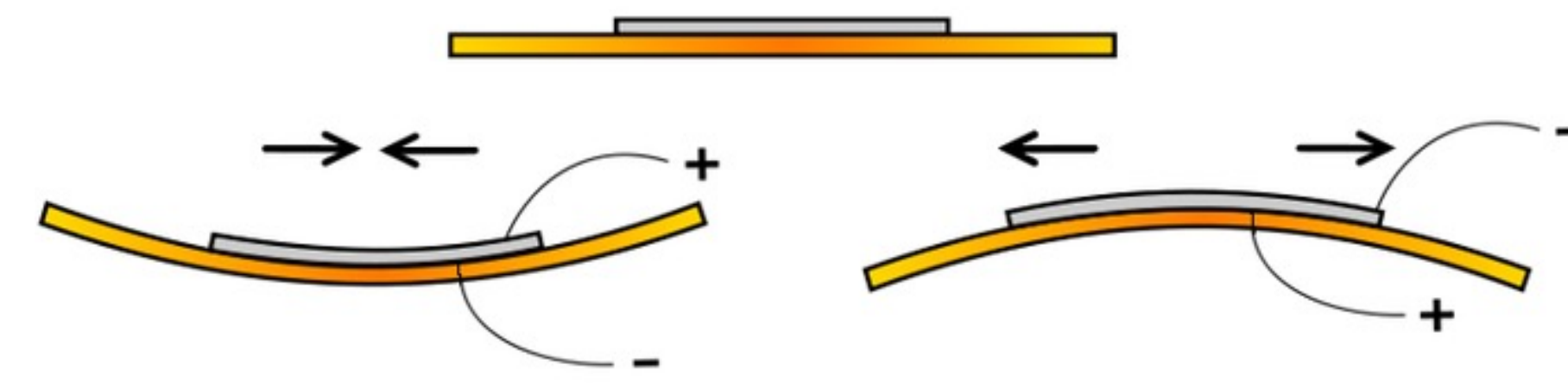
Requirements:

- Small as possible
- Lightweight
- Easy to manufacture
- Microchip AVR 128DB48 nano board
- MPLAB X IDE Software
- Low energy
- Use piezo disk

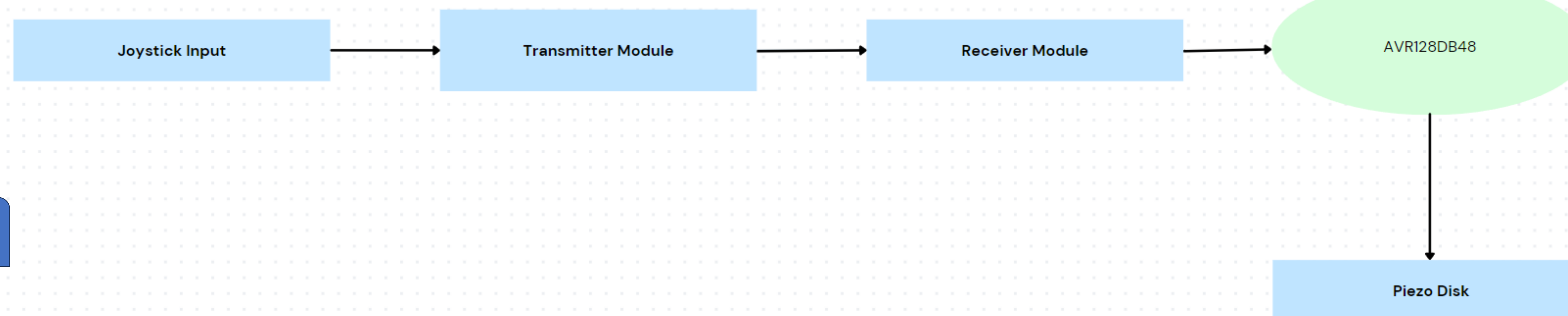
Background:

The goal of this project is to mass-produce a swarm of bots to help aid in collective transport or search and rescue. Future adjustments can be made for flight in later capstone projects.

Concept:



Basic Architecture:



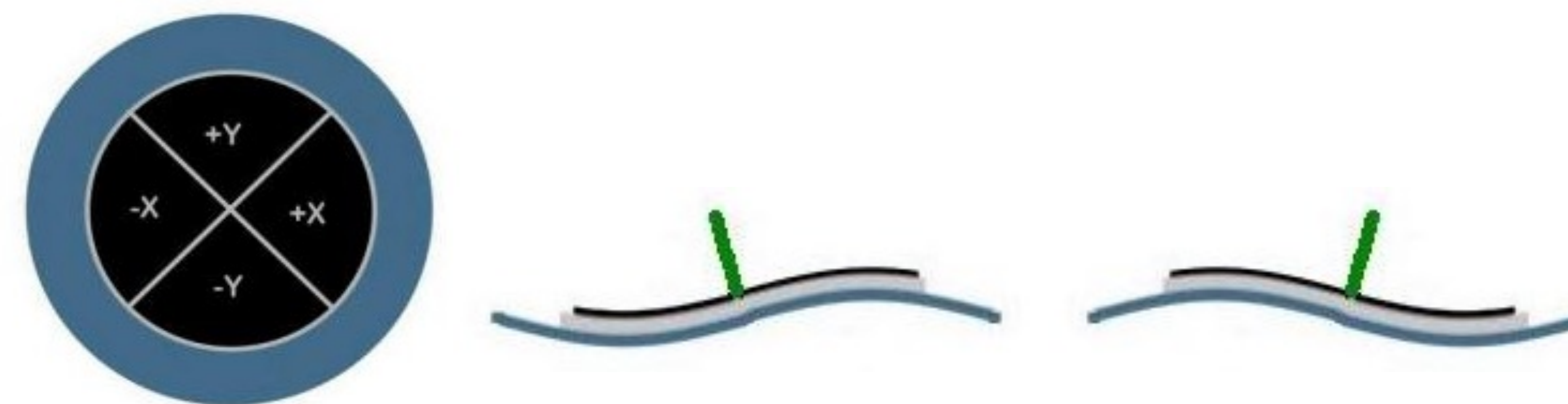
Acknowledgements:

We want to thank Dr. Cunha for providing us with a lot of helpful information and graphics for this project and helping guide us through ideas to get us started. We also want to thank Microchip for providing us with the microcontroller for this project.

By applying an AC voltage, we are able to achieve a flex in the disk.

- Cut the ceramic part of the disk in 3 parts
- Apply a differential voltage to different parts to allow different movement

As for movement we plan to 3D print the legs to be able to move on X-Y plane, that we be applied on the ceramic disc where the cuts are made.



Challenges:

Getting the forward motion was a little difficult, but right now we are facing challenges with the side-to-side movement. We might try and incorporate a turning motion instead.

Analysis:

After setting up an AC square wave signal, the rest of the code is programming a joystick to control the movement of the piezobot. Applying a differential voltage across the 3 sections of the disk can provide us with 2D movement to achieve a minimum of 3 feet of movement. With each input from the joystick, it can apply a specific voltage to each section correlating to which direction is being input

Conclusion:

Future plans include finishing some form of side-to-side movement with the input from the joystick and then incorporate some form of communication between the piezo bots next semester.