Project Work Proposal

WS 22/23

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Bicyclists' Safety Solutions- Relative Positioning and Warning of Impending Vehicles using Atmega

PROJECT DESCRIPTION:

This project focuses on implementing a simple safety solution for bicyclists.

According to statistics by Statista, 36% of people in Germany use their own bicycles for transportation twice a week or more [1]. It saw a 16.8% increase in bicycle fatalities in 2019 compared to 2010- according to Statistisches Bundesamt [2]. It was also the highest number of fatalities with a staggering figure of 445 among all the EU member states [3]. According to [4], the most common fatal bicyclist-motorist crash is likely by a vehicle approaching from behind the bicycle.

Keeping these facts in consideration, the goal of this project is to design a sensor-assisted tracking device for bicyclists that will track any vehicle and will visualize the coordinates of the vehicle (if any) in the LCD display and the piezo buzzer will generate a warning when the vehicle is in certain proximity.

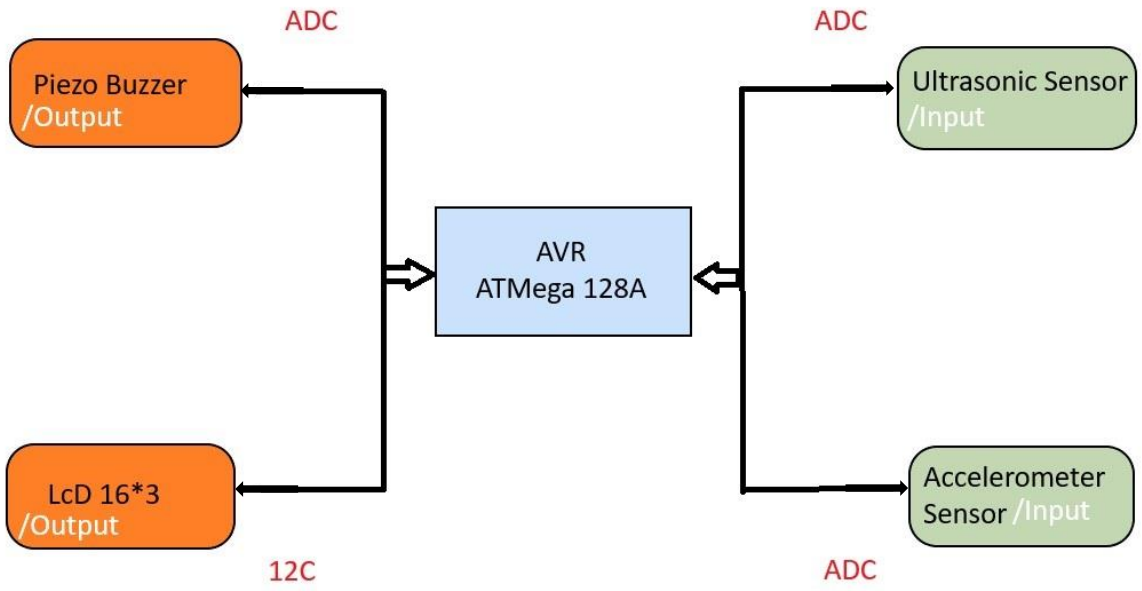
For the project, the components, that will be used, can be categorized as follow:

i) Microcontroller: The project design will be based on the lab-provided PCB board with an embedded Atmega128 chip.
ii) Sensors: Accelerometer, Ultrasonic sensor- HC- SR04(Generic)
iii) Actuator: Piezo buzzer, LCD
iv) Inputs: The analog data from sensors
v) Outputs: Digital signal visualized in LCD and sound by the Piezo buzzer

Pins (0-7) of port F, using the available 8 channels of ADC, can be used for sensors. The buzzer is connected to pin 5 of port B.

The project design will be implemented based on using two interfaces: ADC & I2C. The sensors will be using an ADC interface to convert analog data to a readable digital signal for the microcontroller. The display of data through LCD will be using the I2C interface.

BLOCK DIAGRAM:



References

[1] K. Buchholz and F. Richter, "Infographic: Where cyclists are going places," statista.com. https://www.statista.com/chart/25156/share-using-bike-for-transportation-regularly/. (Accessed Nov 16, 2022).

[2] "One in seven people killed in road traffic in 2019 was a cyclist," Federal Statistical Office, https://www.destatis.de/EN/Press/2020/08/PE20_N049_46241.html. (Accessed Nov 16, 2022).

[3] F.Slootmans, "European Commission (2021) Facts and Figures Cyclists," European Road Safety Observatory, Brussels, European Commission, Directorate General for Transport, Version 1.0, October 2021, Nov. 16, 2022. [Online]. Available: https://roadsafety.transport.ec.europa.eu/system/files/2022-03/FF_cyclists_20220209.pdf

[4] W. Jeon and R. Rajamani, "Rear vehicle tracking on a bicycle using active sensor orientation control," *IEEE Transactions on Intelligent Transportation Systems*, vol. 19, no. 8, pp. 2638–2649, Aug. 2018, doi: 10.1109/TITS.2017.2764006