Bicyclists' Safety Solutions

Relative Positioning and Warning of Impending Vehicles Using ATmega 128A

Raihan Uddin

Ammar Imran Khan

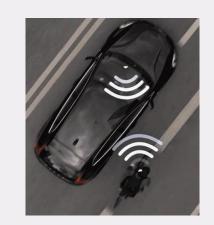**Kashif Raza**

20 Jan 2023

INTRODUCTION

According to Statistics, 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.

[1]

[2]

COMPONENTS

1. Microcontroller: The project design will be based on the lab-provided PCB board with an embedded Atmega128A chip.
2. Sensors: Accelerometer, Ultrasonic sensor- HC- SR04(Generic).
3. Actuator: Piezo buzzer, LCD.
4. Inputs: The analog data from sensors.
5. Outputs: Digital signal visualized in LCD and sound by the Piezo buzzer.

COMPONENTS DESCRIPTION

References
Conclusion
Code
Project
Components
Introduction

Microcontroller:

- The project design will be based on the lab-provided PCB board with an embedded Atmega128A chip.

COMPONENTS DESCRIPTION

Sensors:

- Accelerometer, Ultrasonic sensor- HC- SR04(Generic).
- Accelerometer will be used to get the coordinates X, Y, and Z .
- Ultrasonic Sensor Will detect the object using the SONAR or RADAR rays.

Adxl335 [5]

3Ultrasonic sensor [7]

COMPONENTS DESCRIPTION

Actuator:

- Piezo buzzer, LCD.
- Piezo buzzer will get the signal from sensor and beep accordingly.
- LCD (16*2) will display the results in 10 bit resolution.

Figure 4 Piezo Buzzer [8]

Figure 2 LCD [6]

PROJECT DESCRIPTION

- We have used Atmega 128A Microcontroller & AVR C programming to interface the components with Microcontroller.
- We have used the ADC Pins of Microcontroller which are PF0, PF1 & PF2 for Accelerometer as an Input.
- We have used the ADC Pin PF3 for the Echo Pin of the ultrasonic sensor as an Input.
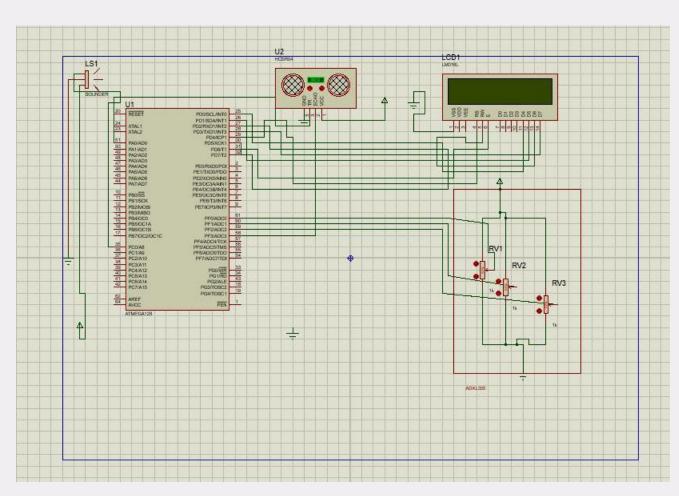
PROJECT DESCRIPTION

ACTUATORS:

- For the LCD we have used the DB4 to DB7 as 4-bit data Pin which are connected with PD0 to PD3 respectively to the board.
- The Enable E pin, RS & RW pins are connected with PD4, PD5 & PD6 to the board.
- For the PIEZO Buzzer we have connected the pin with PC0.
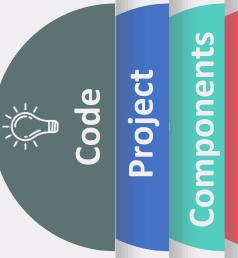
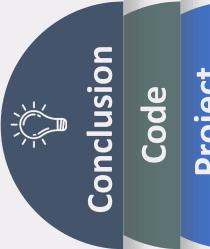# PROJECT DESCRIPTION

CIRCUIT DIAGRAM:

CODE DESCRIPTION

- For the programming of the project, we used the C language to interface it with Atmega 128A microcontroller.
- We used the Microchip studio to program each Module.
- As we have used the ADC pins which will help us to convert the Analog signals to Digital signals.

Conclusion

Code

Project

Components

Introduction

CONCLUSION

- Tilt Sensing will help us to get the GPS coordinates X,Y & Z.
- Target is to make the bicycle riding more safer.
- Can also be used in Cell phones & modern Vehicles.

Conclusion

Code

Project

Components

Introduction

[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

[5] Accelerometer_ADXL335 "Seeed-Studio" Available Online: https://github.com/Seeed-Studio/Accelerometer_ADXL335. (Accessed Jan 02, 2023).

[6] A. Joseph "Interface 16x2 LCD (parallel interface) with Arduino Uno" (2 May, 2020), Available Online: https://www.hackster.io/akshayjoseph666/interface-16x2-lcd-parallel-interface-with-arduino-uno-2e87e2 (Accessed Jan 02, 2023).

[7] csw1"Ultrasonic sensor with Arduino uno"(28 April, 2020) Available Online: https://www.hackster.io/csw1/ultrasonic-sensor-with-arduino-uno-f33ca1. (Accessed Jan 02, 2023).

[8] RND 430-00027 - Piezo Buzzer 82dB 3.2kHz 18V Available Online: https://www.distrelec.de/en/piezo-buzzer-82db-2khz-18v-rnd-components-rnd-430-00027/p/30225582.(Accessed Jan 02, 2023).

References
Conclusion
Code
Project
Components
Introduction

THANK YOU