Safety System with Lidar Sensor

(Lidar Group)

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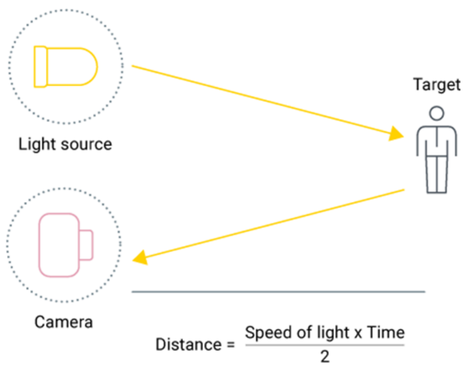
Introduction

Combining many data on distance measurement can reveal very important information. In this context, Lidar (Light Detection and Range) sensors play an important role. Lidar is a method of determining ranges (variable distance) by targeting an object with a laser and measuring the time it takes for the reflected light to return to the receiver. Lidar sensors are one of the methods used in distance measurement and object detection. The created system is for detecting the surrounding objects. The aim here is to increase safety in autonomous systems.

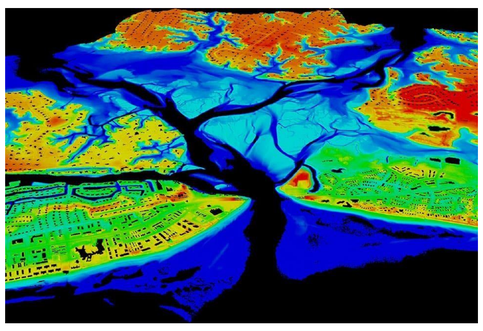
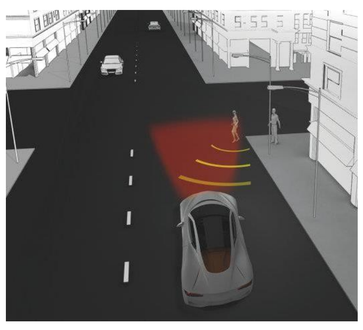
Specifications and Design Requirements

The time-of-flight principle is based on measuring the time it takes for a wave to travel from a source (a time-of-flight sensor) to an object and back.



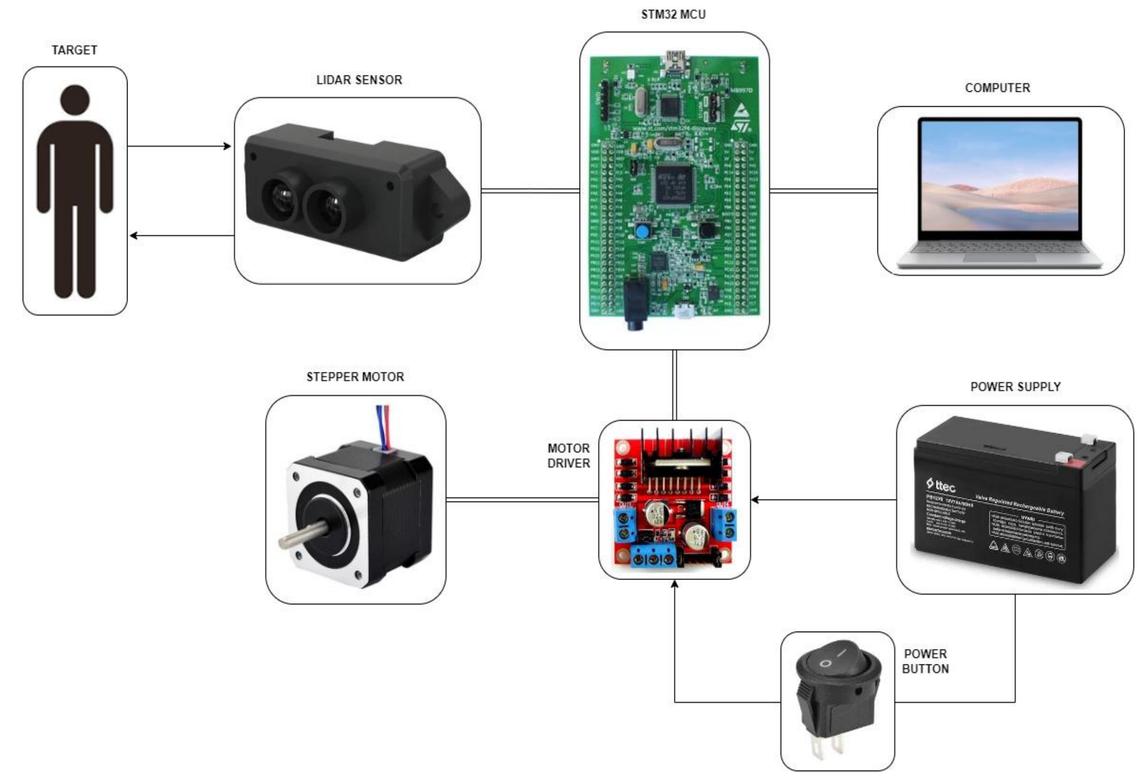
Application Areas

Lidar technologies are used in autonomous vehicles, robotic systems, air and space vehicles. It also allows air and spacecraft to scan for mapping purposes. In many other areas, mostly autonomous technologies...

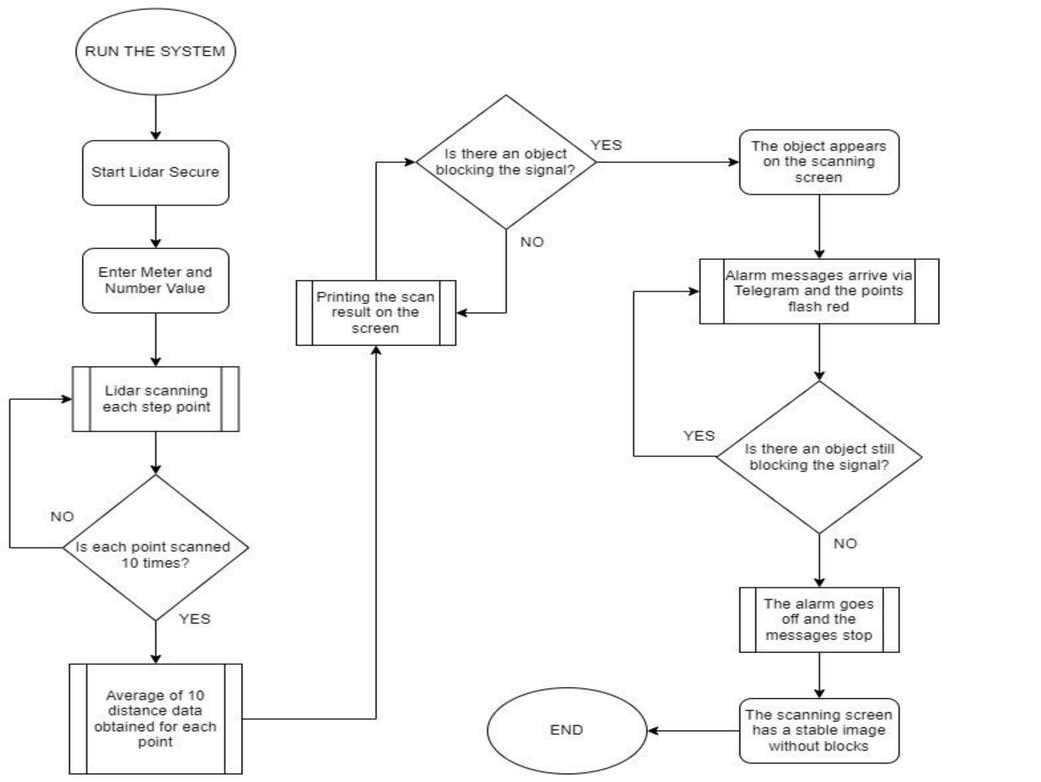

Solution Methodology

In this system, TF MINI Lidar sensor, STM32 MCU, Laptop, Stepper motor driver card, 4 wire stepper motor, 12V 1500mAh Li-Ion battery are used. The use of these components is shown in the block diagram below.



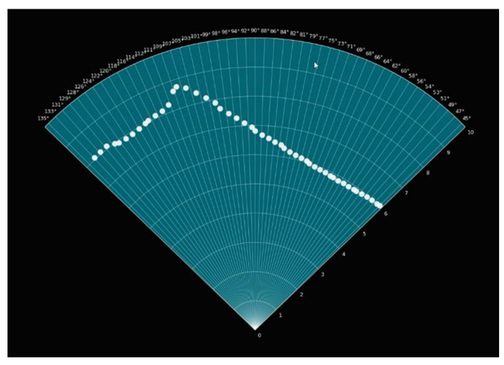
An algorithm has been designed in accordance with the purposes of displaying the object in the scan results and receiving the relevant alarm messages when an object is within the range of the system.

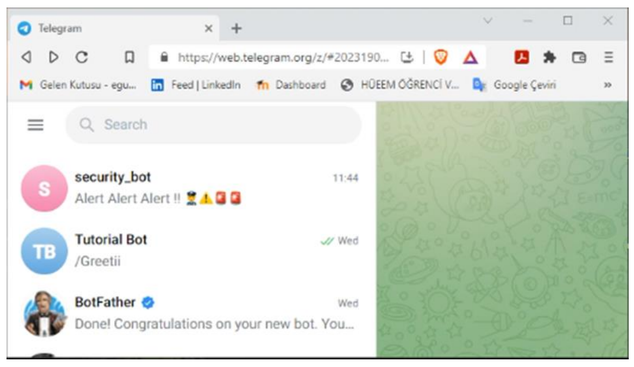
The flow diagram of the system is shown below.

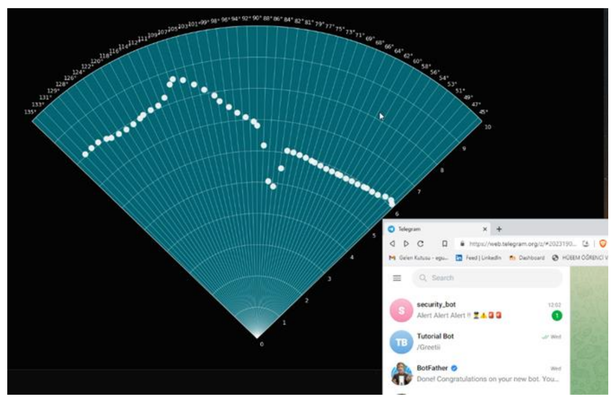


Results and Discussion

As can be seen in the below scanning results, a two-dimensional plane scan was made and an object was detected within the range of the system. However, the distance to this object was also determined. The error margin of the system was measured by measuring the distance between the object and the lidar sensor with a laser meter. Accordingly, the margin of error was calculated as 1.04%.







This work can be made safer by integrating the camera and using image processing techniques in the following stages. In this way, it can also be determined what the object in range is.

References

http://www.farnell.com/datasheets/1653490.pdf

https://en.wikipedia.org/wiki/Serial_Peripheral_Interface

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Acknowledgements

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