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Vehicle Accident Prevention

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Abstract: ***The global road safety annual report estimates that 1.24 million individuals worldwide pass away every year in traffic-related incidents. In addition to the death toll listed above, about 50 million people suffer catastrophic injuries that have a lasting impact on their lives. The proposed system will take in the distance measured by the ultrasonic sensors as an input and vary the speed of the vehicle accordingly which will slow down the vehicle and prevent a collision. We also have the implementation of Automatic-headlights which further reduces the chances of human error by automatically turning on the headlights. We are also adding a luxury component by providing automatic seat adjustment to the driver. In this driver seat will be automatically adjusted based on the preference of the driver.***

Keywords: Accident Prevention, Ultrasonic Sensor, Seat Adjustment, Automatic headlight system, Crash Prevention, Safety.

I. INTRODUCTION

India has the most traffic collisions worldwide, according to the world accident report. Road accidents have given India a questionable reputation. With more than 130,000 fatalities each year, the nation has surpassed China to hold the record for the highest number of road traffic fatalities worldwide.4, 40,042 traffic incidents resulted in 1, 39,091 fatalities in the nation last year. With 16,175 fatalities in 67,757 incidents, Tamil Nadu tops the list, followed by Uttar Pradesh with 15,109 fatalities in 24,478 accidents. With 14,966 fatalities in 39,344 accidents, Andhra Pradesh comes in third and Maharashtra fourth with 13,936 deaths in 45,247 accidents.

The Capital city of Delhi accounts for about 1,866 deaths in 6,937 accidents Annual Road accident rates in India were respectively 15.4%, 10.3%, and 10.1% in the states of Tamil Nadu, Uttar Pradesh, and Andhra Pradesh. Now a days, many a times some obstacle comes in front of the vehicle and the driver doesn't get enough reaction time. So, we are developing a project in which the speed of car automatically decreases on detection of any obstacle that comes in front the vehicle. This will help in prevention of accidents to a large extent.

We are also adding a luxury component by providing automatic seat adjustment to the driver. In this driver seat will be automatically adjusted based on the preference of the driver. Also, we will add the feature of automatic headlights by using LDR sensor. In this the headlights of the vehicle will automatically turn on sensing dip of adequate environment light. Thus, our project will help in prevention of accidents as well as provide features and assistance to the driver by providing automatic seat adjustment as well as automatic headlamps.

II. LITERATURE SURVEY

1) Gabler, H. C., & Hollowell, W. T. (2000). The crash compatibility of cars and light trucks. *Journal of Crash Prevention and Injury Control, 2(1), 19-31*: This paper investigates the compatibility of cars, light trucks, and vans (LTVs) involved in traffic crashes. An examination of U.S. crash statistics reveals that, despite accounting for roughly one-third of all registered passenger vehicles in the country, collisions between cars and LTVs account for more than half of all fatalities in light vehicle-to-vehicle crashes [1]
2) Lakshmi K, Nevetha R, Ilakkiya S N, Ganesan R (2019). Automatic Vehicle Headlight Management System to Prevent Accidents Due to Headlight Glare. *International Journal of Innovative Technology and Exploring Engineering (IJITEE) Volume-8 Issue-9*: Here, the car's headlight beam is lowered in accordance with the brightness of the light coming from the vehicle in front of it. The high beam from the opposing car on the road is detected using LDR. [2]
3) Teoh, E. R. (2021). Effectiveness of front crash prevention systems in reducing large truck real world crash rates. *Traffic Injury Prevention, 22(4), 284-289*: Automatic emergency braking (AEB) and forward collision warning (FCW) have the potential to avoid or lessen many collisions involving heavy trucks. Although the efficiency of these systems in passenger cars is well recognized, little is known about how well they perform in huge trucks. [3]

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4) Joshi, R., & Banginwar, S. (2020). Height adjustment in school bus seat to improve comfort of children with different age group. *SAE Technical Paper Series*: Seats are an important component of a school bus for the comfort and safety of the children. The thickness of the seat foam, its shape, cushion width, and seat height all play an important role in comfort. Fatigue is a common result of uncomfortable seating, and it is caused by the fact that school buses only have one type of seat to accommodate different height children. (Different height means that children in schools range from nursery to senior secondary.) Fatigue has an impact on children's health and development. [4].

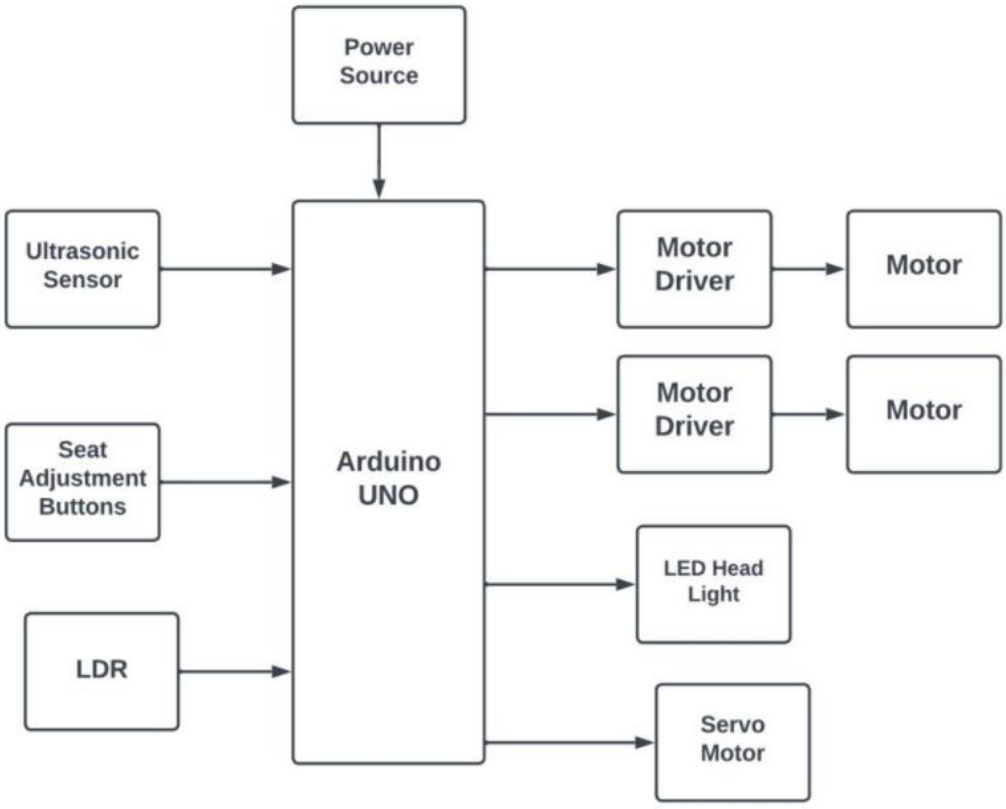
III. RELATED WORK

In [1] author investigates the compatibility of cars, light trucks, and vans (LTVs) involved in traffic crashes. According to these statistics, LTVs and passenger cars are incompatible in traffic accidents, and LTVs are the more aggressive of the two-vehicle classes. This gives us a better understanding of the scenario. [2] touches upon the problems related to visibility that occur on road due to approaching vehicles and dim lit areas which hinder the visibility of the driver resulting in accidents. This was the idea behind the automatic headlights that can change intensity of the light according to the vehicle's surroundings. [3] deals with the Automatic emergency braking (AEB) and forward collision warning (FCW) that have the potential to avoid or lessen many collisions. This played a major role in developing the automatic braking and speed reduction mechanism of the vehicle. [4] deals with the role of seating in vehicles where it was observed that the type of seat and the comfort actually plays a large role in the amount of fatigue accumulated by the driver. These factors led to the conclusion of developing better viewing angles for the driver with the goal of providing better viewing angles and better visibility.

IV. METHODOLOGY

Accident Prevention systems consist of both hardware and software components, to prevent road accidents. Additional features such as automatic headlight on and off and automatic seat adjustment can also improve safety and comfort for drivers and passengers.

A. Block Diagram



To prevent accidents, ultrasonic sensors are utilised to identify probable collisions. High-frequency sound waves are emitted by these sensors, which then time how long it takes for the waves to return after hitting nearby objects. To calculate the size and placement of items in the environment, this data will be employed.

An Arduino Nano microcontroller is used to process the ultrasonic sensors' data. The data are analysed, and potential accidents based on specified criteria are identified using integrated C programming on the Arduino.

The Arduino will decide how to prevent the mishap after analysing the data and identifying a probable accident. If an impediment is present at less than thirty centimetres, the vehicle will slow down, and if the obstacle is present at less than ten centimetres, the vehicle will come to a halt.

Now that we have added the Light Dependent Resistor sensor, the vehicle's lighting intensity will be adjusted automatically based on the amount of ambient light. This will aid in giving the oncoming car more visibility. We also have a seat inclination system where servo motors are used to change the angle of the seat. Three switches on our system will be fixed with the predetermined seat angle. The user only needs to push the desired inclination; the seat's inclination will then alter accordingly.

B. Hardware Requirements

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A detailed description of the components are given below.

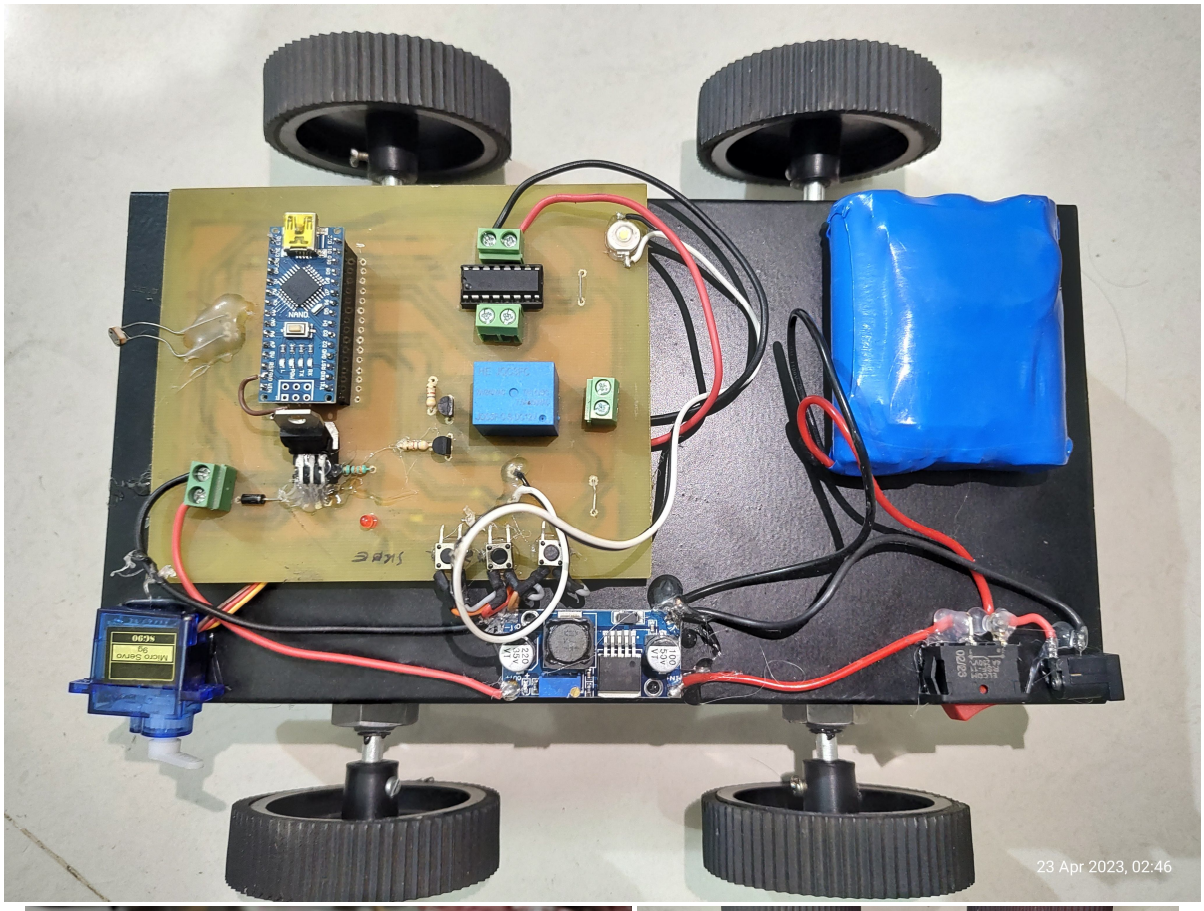
1) *Arduino Nano*: The Arduino Nano is a small Arduino board based on ATmega328P or ATmega628 Microcontroller. The programming of an Arduino nano can be done using the Arduino software. This forms the base of our project as the various hardware components like Ultrasonic Sensor and Motors to be interfaced/connected to this board. This allows the project to function as a whole with different components working together
2) *Ultrasonic Sensor:* The distance between the car and the obstacle is calculated using an ultrasonic distance sensor and the output from the sensor is provided to the signal conditioning section and then is processed using Arduino Nano. Here HC-SR04 ultrasonic sensor is used to detect the level of the garbage bin. Here the TRIG pin receives the controlling signal from the Arduino Nano which is the input pin. ECHO pin is used for sending signals to the Arduino Nano where the Arduino Nano calculates the pulse duration to know the distance between the car and the obstacle. This pin is the ECHO output of the sensor. This sensor provides a non-contact range detection between 2 cm to 400 cm (~13 feet) with an accuracy of 3 mm. As it operates on 5 volts, it can be connected directly to any 5V logic microcontroller.
3) *DC Motor:* The main principle of a DC motor or Direct Current Motor is to convert the direct current energy into mechanical energy. The energy generated is used to drive the motor. The rotation of DC Motor can be controlled, which makes it ideal an ideal choice for various mechanical applications. This makes it a suitable choice for our project, where we need to control the speed of the DC motor corresponding to the distance between the car and the obstacle calculated by the ultrasonic sensor
4) *Servo Motor:* Servo motor is a type of DC motor which is used If we want to rotate an object at some specific angles or distance. A servo motor usually has a mechanism that allows us to get a very high torque. This makes it a suitable choice for our project where we need to adjust the inclination of the car seat according to the user's specifications. A motor with the capacity to provide high torque and ability to move through various angles of inclination is thus an absolute necessity.
5) *LDR (Light Dependent Resistor):* A photoresistor, also known as an LDR (Light Dependent Resistor), changes its resistance in response to the light it is exposed to. That is, the resistor will have a resistance of a few Mega ohms when placed in a dark environment, and as light is gradually shone on the sensor, the resistance will begin to drop from a few Mega ohms to a few Ohms.

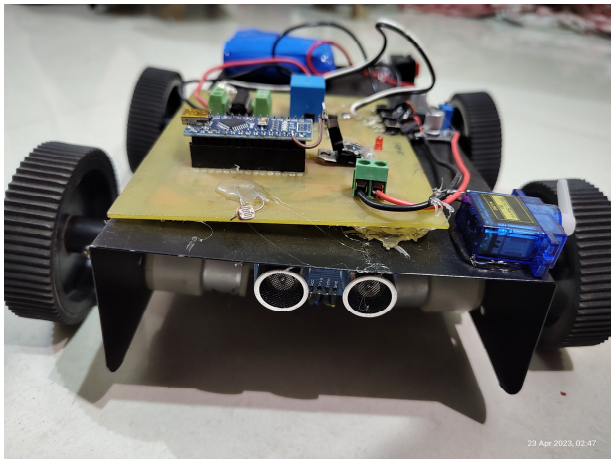
V. RESULTS

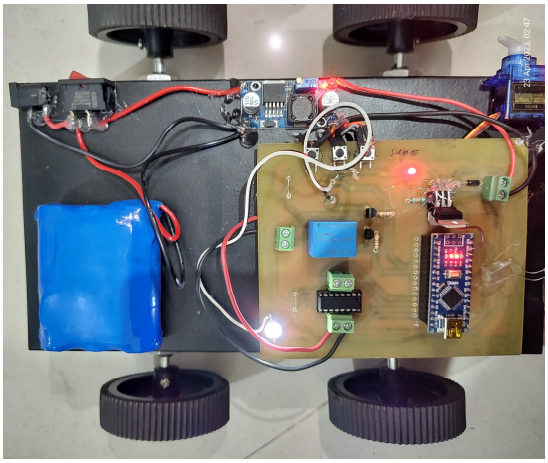
The project is developed utilizing a variety of tools and applications. The project uses an ultrasonic sensor, servo motor, DC motor, and Arduino nano. In this process main issue, we are trying to solve is the prevention of vehicle collisions that may occur due to human error (misjudgement of distance, poor visibility due to bad lighting conditions, not having a clear view of the road while driving). The driver seat will be automatically adjusted based on the preference of the driver due to the automatic seat adjustment feature provided. The headlights of the vehicle will automatically turn on sensing a dip in ambient light due to the automatic headlights.

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Thus, our project will help in prevention of accidents as well as provide features and assistance to the driver while on road.







VI. ACKNOWLEDGMENT

The heading of the Acknowledgment section and the References section must not be numbered. We express our heartfelt appreciation to Dr. S.D. Lokhande for his invaluable support and guidance throughout the project, the principal of our college, and Dr. M.B. Mali, the Head of the Department of Electronics and Telecommunication for granting us permission to undertake this project and providing us with unrestricted access to the laboratory facilities. We also wish to express our heartfelt appreciation to our project guide, Dr. S.D. Lokhande and Dr. S.S Lokhande, for dedicating time and effort to support us throughout the project. Additionally, we extend our thanks to the Entc Department staff for their assistance. Lastly, we would like to thank our fellow classmates for their unwavering support and encouragement throughout the project.

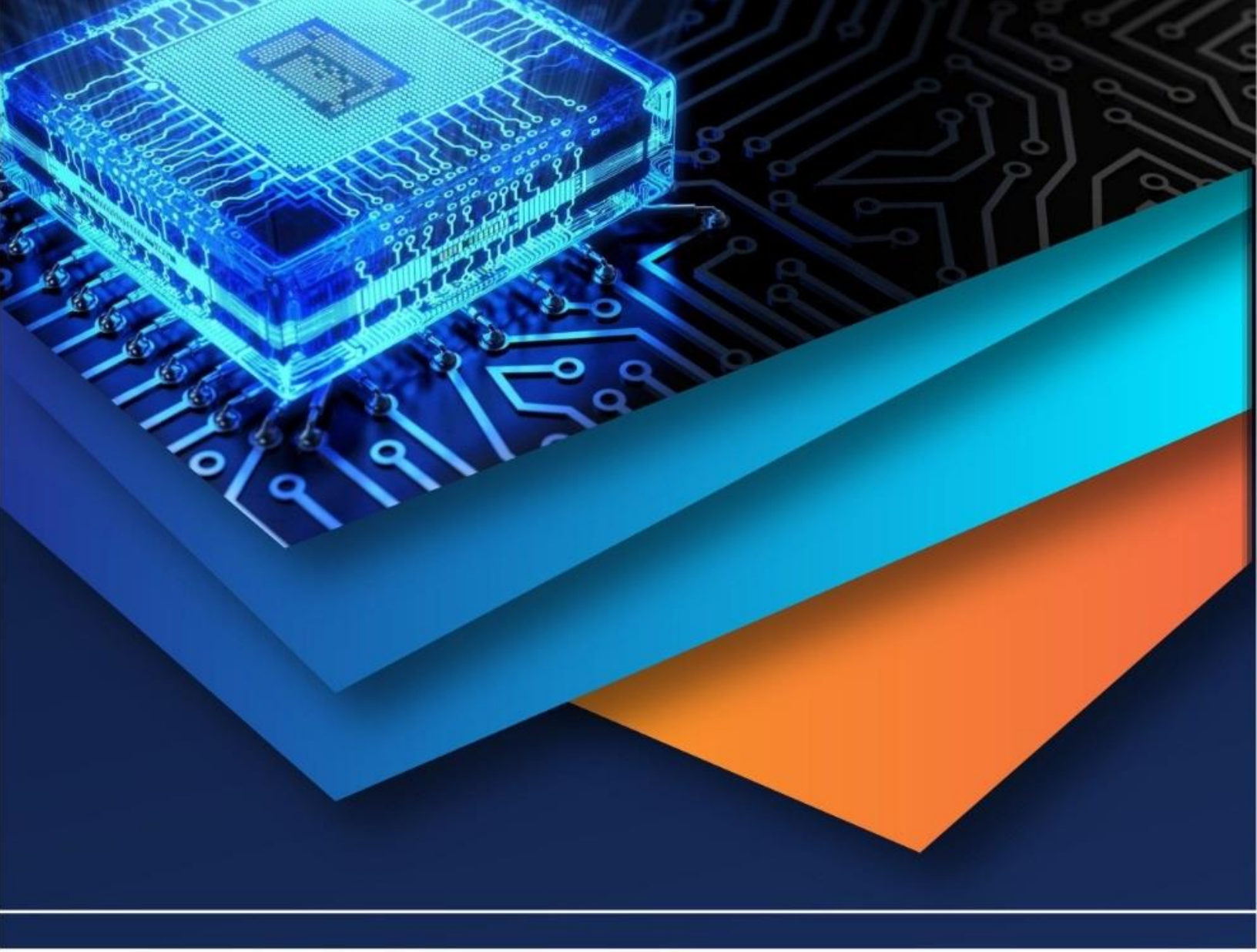
VII. CONCLUSION

This project works on vehicle crash prevention by means of reducing the speed of the vehicle if an obstacle comes in front of the vehicle. The proposed system also helps the driver by adjusting the driver seat. This in turn, provides them with the best possible viewing angles for a stress-free experience while driving leading to lesser road accidents. We will also use this system to automatically turn on and adjust the intensity of the headlamps of the vehicle so that the driver has no obstruction.

REFERENCES

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