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DESIGN AND IMPLEMENTATION OF ACCIDENT PREVENTING, DRIVER INTOXICATION FINDING SYSTEM USING FEEDBACK AND IOT

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ABSTRACT

This project mainly focused on designing an embedded system that detects the objects/vehicles which are moving in a lane, in front of our vehicle this is done by employing ultrasonic sensor and this system also detects that, if at all a driver is consumed some alcohol greater than a certain level then the system gives us alarm through IVRS. The detection of alcohol is done by means of alcohol sensor. Some more additional features are implemented in the system, like if a vehicle before ours is applied emergency break then we must apply emergency breaks also, this reduces the chance of accident but somehow the damage will be done to the vehicle. To overcome this problem, a feature was implemented that it automatically reduces our vehicle speed to 50% of its duty cycle to avoid the collision. The system also sends a text SMS to the owner of the vehicle if the driver consumes more alcohol than the allowed value and vehicle do not start until the level of consumed alcohol reduces to safe value. The alcohol sensor value will be transferred to the webpage. The system employs Raspberry Pi to perform the designed task.

Key Words: Vehicle detection, alcohol sensing, IVRS, IoT.

1. INTRODUCTION

Autonomous and semiautonomous vehicles have a huge potential for boosting the efficiency of road transportation systems via safe increases in traffic density, minimizing pollutions, and energy waste. As such, they are currently under active research and development. A primary research area for these vehicles is the design of robust and computationally feasible control frameworks that guarantee a collision-free trajectory guidance of the vehicles under the constraints of prevailing road boundaries, other objects, and traffic regulations. The majority of the existing studies in trajectory planning and guidance are found in the robotics field, where various algorithms are proposed to find collision-free trajectories under static and dynamic constraints in the available space. In this discussion, the word trajectory is used to mean state trajectories (including, at a minimum, both position or path and speed) for the controlled robot/vehicle. The state of the art in planning methods roughly falls into three groups. The first are the sampling-based methods where the state and/or input space is discretized or randomly sampled in lattices and then efficient heuristics for deterministic or stochastic searching, such as the A graph search or Rapidly Exploring Random Tree algorithm is applied to find the collision-free trajectory based on an objective function [1]–[3]. However, the existence and optimality of the solution depends on the size of the lattice; improves with lattice size but comes at the cost of higher computational burden. A second group implements decoupling schemes for planning the global path and for the calculation of the speed for local obstacle avoidance [4]. This is also a useful separation for passenger vehicles on public roads, since the planning of the global path (often used to mean navigation or route finding via a GPS-based navigation system employing street maps) and replanning in case that a collision is eminent locally. For the problem of replanning state trajectories near dynamic obstacles, special algorithms have been proposed for specific maneuvers, such as lane change and obstacle avoidance [5], [6]. The disadvantage of such maneuver specific planning algorithms is the added need for a maneuver detection and coordination scheme. A third group of planning algorithms involve mathematical constrained optimization formulations which offer some guarantees of conditional existence and optimality of the solution based on the convexity of the problem formulation and the quality of initial guesses [7], [8].

2 LITURATURE REVIEW

Thomas weiskircher proposed a predictive trajectory guidance and control framework that enables the safe operation of autonomous and semiautonomous vehicles considering the constraints of operating in dynamic public traffic. The core module of the framework is a nonlinear model predictive guidance module that uses a computationally expedient curvilinear frame for the description of the road and of the motion of the vehicle and other objects. The module enforces constraints generated from information about obstacles/other vehicles/objects, public traffic rules for speed limits and lane boundaries, and the limits of the vehicle's dynamics. The module can be configured in two basic modes. The first is a tracking mode, where the control inputs computed by the model predictive guidance module act as references for traditional lower level control systems. The second is a planning mode, where the traffic-optimal state trajectories computed by the model predictive control are reinterpreted for planning the optimal path and speed, which in turn can be tracked by an elaborate speed and path tracking controller. The performance of most aspects of the proposed scheme is illustrated by considering various simulations of the control framework applied to a high-fidelity vehicle dynamics model of the (semi-)autonomous vehicle in typical public driving events, such as intersections, passing, emergency braking, and collision avoidance. The feasibility of the proposed control framework for real-time application is highlighted with the discussions of the computational execution times observed for these various scenarios.

D N godbole analyzed the problem of obstacle avoidance in an automated highway system. for a given scenario (traffic state, obstacle location, etc), we synthesize the best possible avoidance manoeuvre for each vehicle. Our aim is to obtain a distributed strategy so that the obstacle avoidance manoeuvres can be executed by vehicle based controllers (with some inter-vehicle communication) as opposed to a road side controller making decisions and communicating it to the individual vehicles

3. SYSTEM WORKING

The system detects the vehicles which are moving in front of our vehicle, system also detects that, if at all a driver is consumed some alcohol greater than a certain level then the system gives us alarm through IVRS. Whenever our vehicle approaching a vehicle then, it automatically reduces our vehicle speed to 50% of its duty cycle to avoid the collision. The system also sends a text SMS to the owner of the vehicle if the driver consumes more alcohol than the allowed value and vehicle do not start until the level of consumed alcohol reduces to safe value.

3.1 SYSTEM ARCHITECTURE

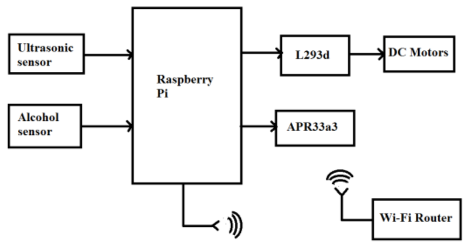

Fig 1: Block diagram of Design and implementation of accident preventing, driver intoxication finding system using feedback and IoT

Ultrasonic sensor:

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: (1) Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high

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level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2,

Fig 2: Ultrasonic sensor

Alcohol sensor:

An Alcohol detector is a device that detects Alcohol and issues an alarm. Alcohol detectors alert people within hearing range. Alcohol detectors have come a long way since George Darby first invented in 1902. Before scientists knew how to capture ionizing molecules in a small enclosed space, they actually used an open/close electrical system along with a wedge of butter to detect fires and heat. This system's setup included two plates or electrical circuits, not unlike today's Ionization alarms, with a wedge of butter between them. When the heat of the room became overwhelming and dangerous, the butter would melt, causing the two circuits to collapse onto one another, initiating the alarm. Since then, technology has found a way to capture light and molecules in a cheaper, more efficient, and safer way to save millions of lives each year. There are two types of Alcohol detectors common to today's normal household: ionization and photoelectric Alcohol detectors. These Alcohol detectors are both used to detect Alcohol. Photoelectric Alcohol Detectors are faster in detecting, while Ionization Alcohol Detectors are better at their ability to detect smaller particles.

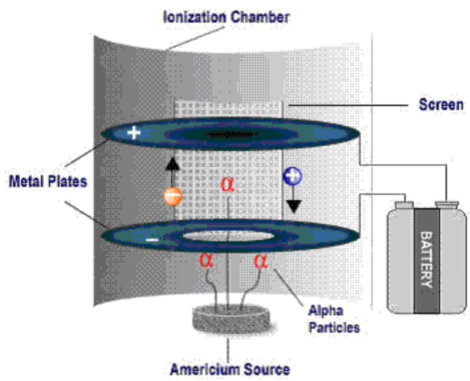

Fig 3: Alcohol sensor

L293d:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

Features:

- Featuring Unitrode L293 and L293D Products Now From Texas Instruments
- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Thermal Shutdown
- High-Noise-Immunity Inputs
- Functionally Similar to SGS L293 and SGS L293D
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)

Pin diagram:

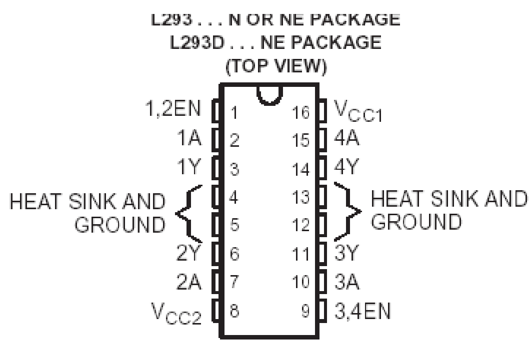

Fig 4: L293d driver IC

DC MOTOR:

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.

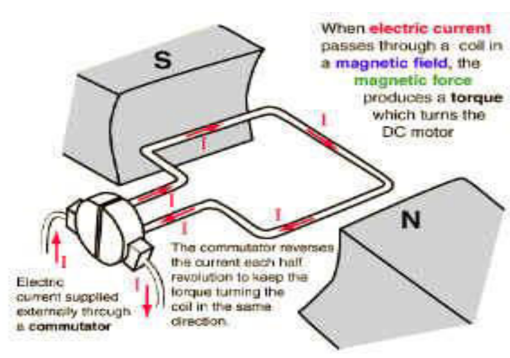

Fig 5: DC motor working principle

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APR33a3 VOICE MODULE:

Today's consumers demand the best in audio/voice. They want crystal-clear sound wherever they are in whatever format they want to use. APLUS delivers the technology to enhance a listener's audio/voice experience.

The APR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

The aPR33A series C2.0 is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch, It is suitable in simple interface or need to limit the length of single message, e.g. toys, leave messages system, answering machine etc. Meanwhile, this mode provides the power-management system. Users can let the chip enter power-down mode when unused. It can effectively reduce electric current consuming to 15uA and increase the using time in any projects powered by batteries.

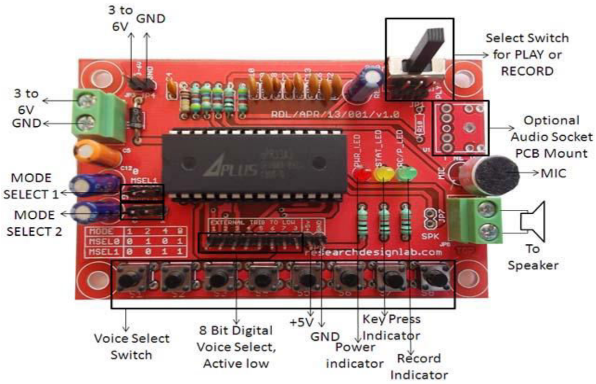

Fig 6: APR33a3 voice module

FEATURES

- Operating Voltage Range: 3V ~ 6.5V
- Single Chip, High Quality Audio/Voice Recording & Playback Solution
- No External ICs Required
- Minimum External Components
- User Friendly, Easy to Use Operation
- Programming & Development Systems Not Required
- 170/ 340/ 680 sec. Voice Recording Length in aPR33A1/aPR33A2/aPR33A3
- Powerful 16-Bits Digital Audio Processor.

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- Nonvolatile Flash Memory Technology
- No Battery Backup Required
- External Reset pin.
- Powerful Power Management Unit
- Very Low Standby Current: 1uA
- Low Power-Down Current: 15uA
- Supports Power-Down Mode for Power Saving
- Built-in Audio-Recording Microphone Amplifier
- No External OPAMP or BJT Required
- Easy to PCB layout
- Configurable analog interface
- Differential-ended MIC pre-amp for Low Noise
- High Quality Line Receiver
- High Quality Analog to Digital, DAC and PWM module
- Resolution up to 16-bits

RASPBERRY PI:

The Raspberry Pi is a series of small single board computers developed in the united kingdom by raspberry pi foundation to promote the teaching of basic computer science in schools and developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards, mice and cases). However, some accessories have been included in several official and unofficial bundles.

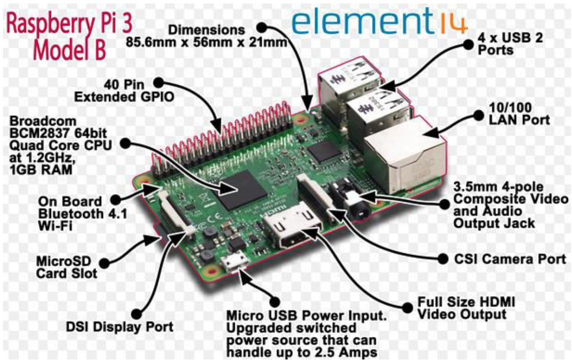

Fig 7: Raspberry Pi

The Raspberry Pi has a Broadcom BCM2835 System on Chip module. It has a ARM1176JZF-S processor. The Broadcom SoC used in the Raspberry Pi is equivalent to a chip used in an old smart phone (Android or iPhone). While operating at 700 MHz by default, the Raspberry Pi provides a real world performance roughly equivalent to the 0.041 GFLOPS. On the CPU level the performance is similar to a 300 MHz Pentium II of 1997-1999, but the GPU, however, provides 1 Gpixel/s, 1.5 Gtexel/s or 24 GFLOPS of general purpose compute and the graphics capabilities of the Raspberry Pi are roughly equivalent to the level of performance of the Xbox of 2001. The

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Raspberry Pi chip operating at 700 MHz by default, will not become hot enough to need a heatsink or special cooling. The Pi is a device which consumes 700mA or 3W or power. It is powered by a MicroUSB charger or the GPIO header. Any good smartphone charger will do the work of powering the Pi. The Raspberry Pi does not have any onboard storage available. The operating system is loaded on a SD card which is inserted on the SD card slot on the Raspberry Pi. The operating system can be loaded on the card using a card reader on any computer. General-purpose input/output (GPIO) is a generic pin on an integrated circuit whose behaviour, including whether it is an input or output pin, can be controlled by the user at run time.

4. RESULT:

In this chapter the results and observations of the system

Output observed at kit

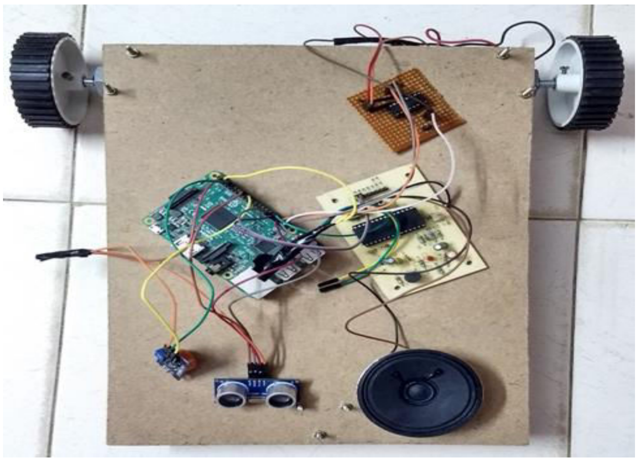

Fig 8: implementation of the system

Output observed in SMS

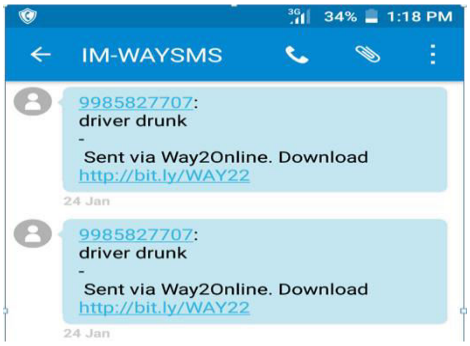

Fig 9: output in SMS

Output observed in IoT

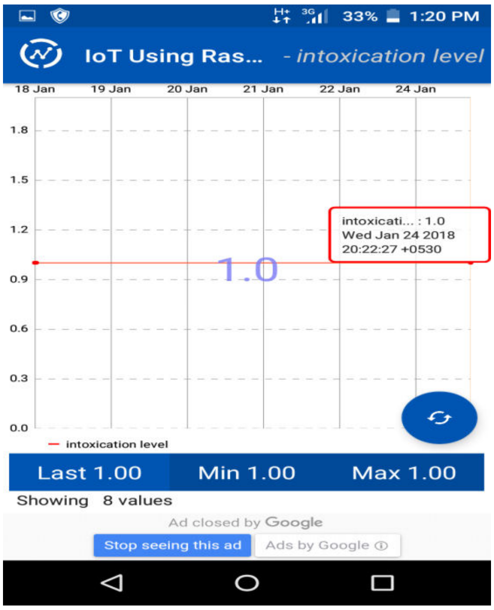

Fig 10: output in IoT

5. CONCLUSION

This paper presented a versatile PTG framework for fully autonomous and semiautonomous vehicles feasible for realtime implementation. A nonlinear model of particle motion descriptions and road references expressed in curvilinear Frenet frames is used in the PTG level to formulate and solve a nonlinear MPC problem. The formulation integrates several references, obstacle descriptions, and hard constraints imposed by a traffic management or assigner module for lane limits and traffic signal information, as well as vehicle dynamics and actuation constraints. The control inputs computed at the PTG level can be utilized as control references by vehicle dynamics control (VDC) level in tracking mode or merely treated as planned optimal trajectories in planning mode by a suitable speed and path tracking VDC. A number of simulation results were included to illustrate the performance of the PTG with VDC in tracking mode interfaced with a high-fidelity vehicle model for both fully autonomous and semiautonomous modes in public traffic situations. It is shown that the overall scheme shows good performance in various scenarios with dynamic objects and operating modes. It is also illustrated that the use of the particle motion model in the PTG allows reasonable and practically feasible execution times, while handling active inequality constraints prevalent in dynamic public traffic scenarios. Future work will include extensions of the predictive guidance framework to accommodate uncertainties from environmental conditions, sensor imperfections, and other disturbances.

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