ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

A Survey on Design and Implementation of Autonomous Vehicle Communication System

Asmita Koli

M. Tech Student, Department of Information Technology, Walchand College of Engineering, Sangli, Maharashtra, India

ABSTRACT: To implement driverless cars, an autonomous vehicle communication system is designed. This system is designed using advanced driver-assistance system features. This system helps to establish communication between driverless car and user. The system consists of three modules vehicle module, cloud module and mobile device module. Vehicle module consists of Inter Vehicle Communication device. Cloud module consists of different Amazon web services. Mobile device module consists of mobile device and different applications.

KEYWORDS: ADAS, Automation, Automatic Parking, Amazon Web Services.

I. INTRODUCTION

With the development of automobile industry, the number of vehicles is increasing dramatically while driving space available in a city is decreasing drastically. Almost all drivers feel that driving in a city is more difficult and they have to pay more attention than ever before. Meanwhile, traffic accidents occur frequently in recent years, especially during rush hours every day. Many automobile manufacturers have applied assistant driving system into vehicles to make driving safe and smooth.

1.1 Automotive Driver Assistance System

Advanced driver-assistance systems (ADAS) are systems developed to enhance vehicle systems for safety and better driving. Safety features are designed to avoid collisions and accidents by offering technologies that alert the driver to potential problems, or to avoid collisions by implementing safeguards and taking over control of the vehicle. Adaptive features may automate lighting, provide adaptive cruise control, automate braking, incorporate GPS/ traffic warnings, connect to smartphones, alert driver to other cars or dangers, keep the driver in the correct lane, or show what is in blind spots.Advanced Driver Assistance Systems (ADAS) are designed in order to dynamically assist the driver in escaping from accidents before they occur by taking part of their responsibility in certain situations. ADAS attempt to amplify drivers using either warning messages to decrease risk exposure or through the automation of standard control tasks, aiming to relieve a driver from manually controlling the vehicle. To be more specific, ADAS could replace some of the human driver decisions and actions with precise machine tasks, managing to lessen a variety of the human errors which would probably result in accidents, while reaching more balanced and steady vehicle control with enlarged capacity, related energy and environmental benefits.

1.2 Automotive Parking

Automatic parking is an autonomous car-maneuvering system that moves a vehicle from a traffic lane into a parking spot to perform parallel, perpendicular or angle parking. The automatic parking system aims to enhance the comfort and safety of driving in constrained environments where much attention and experience is required to steer the car. The parking maneuver is achieved by means of coordinated control of the steering angle and speed which takes into account the actual situation in the environment to ensure collision-free motion within the available space.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

II. RELATED WORK

In 2012 Chun H siung Chen, C. W. Hsu and C. C. Yao [5] proposed an obstacle orientation algorithm and a path planning of multi-turn mode to apply in automatic parking systems. The vehicle parks at a low velocity by developing a braking strategy. In addition to the design of controllers, a speed trajectory consisting of acceleration, constant speed, and deceleration is planned in order to provide the driver more comfortable feeling. According to the result of the verification tests, the obstacle orientation algorithm could accurately identify the 2D coordinate. And the proposed path planning of multi-turn mode saves one meter than the traditional two-turn mode. It makes the parking space only need 1.28 times the vehicle length. The vehicle control is implemented using Fuzzy-PID tracking control. System performance and tracking ability are verified in hardware and software implementations with very low cost.

In 2014 H. r. Dong, S. t. Jin and Z. s. Hou [6] proposed a Model Free Adaptive Control (MFAC) scheme for automatic car parking systems. The scheme consists of a control algorithm, a parameter estimation algorithm and a parameter reset algorithm. The design of the proposed scheme only uses the input and output (I/O) data, and does not involve any model information of the controlled car. Therefore, the MFAC based automatic parking system is applicable for different kinds of car. The simulation comparisons among MFAC scheme and PID control scheme are given for different kinds of car with different parking speed. The simulation results show that the proposed MFAC scheme has smaller tracking errors in the orientation angle of the car, the x axis and y axis.

In 2014 Lalitha Iyer and Manali Tare [7] proposed an Android Application-"Park Me" which is to help the user to analyze area's where parking is available and number of slots free in that area. Additionally, four hours prior to his expected arrival, the user can pre-book a slot in the area he desires if it is available. This will help reduce the load on the administrator as his physical work reduces drastically and user can search the parking slot through Android Application.

In 2016 J. K. Suhr and H. G. Jung [1] proposed a detection method which finds parking spaces based on a high-level fusion of two complementary approaches: parking slot marking-based and free space-based. Parking slots are detected by estimating parallel line pairs and free spaces are detected by recognizing the positions of parked vehicles as well as pillars. The proposed tracking method enhances the previous method by considering pillar information. Since pillars degrade parking slot tracking performance, this method estimates a pillar region and utilizes it to remove false edges and to estimate the amount of occlusion.

In 2016 J. B. Li, K. Wang and Z. Shao [2]concerned a planning time-optimal parallel parking maneuvers in a straight forward, accurate, and purely objective way. A unified dynamic optimization framework is established, which includes the vehicle kinematics, physical restrictions, collision-avoidance constraints, and an optimization objective. Interior-point method (IPM)-based simultaneous dynamic optimization methodology is adopted to solve the formulated dynamic optimization problem numerically. Given that near-feasible solutions have been widely acknowledged to ease optimizing nonlinear programs (NLPs), a critical region-based initialization strategy is proposed to facilitate the offline NLP-solving process, a lookup table-based strategy is proposed to guarantee the on-site planning performance, and a receding-horizon optimization framework is proposed for online maneuver planning.

In 2017 M. Y. Aalsalem and W. Z. Khan [3] proposed a smart vehicle parking monitoring and management system called CampusSense. In CampusSense, Automatic Number Plate Recognition (ANPR) cameras and android based mobile application is developed to efficiently monitor, manage and protect the parking facilities at university campuses. Parking problems around the university campus faced by the students, faculty and staff members are analyzed by conducting a survey.

III. PROPOSED METHODOLOGY

Figure 1. illustrates the architecture diagram of the autonomous vehicle communication system. Which specifically consists of three modules vehicle module, cloud module and mobile device module. Vehicle module consists of Inter Vehicle Communication device, microcontroller and kvasar and vehicle simulator. Vehicle module consist of a number of microcontroller and vehicle simulator which can communicate with each other through the CAN protocol using kvasar. Cloud module consists of different Amazon web services like IoT Hub, Lambda Function, Cognito, API Gateway, SNS (simple notification service) and DynamoDB. Communication between vehicle and cloud

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

module can be using MQTT (Message Queue Telemetry Transport) protocol. Mobile device module consists of mobile device and different applications developed to establish communication between user and vehicle.

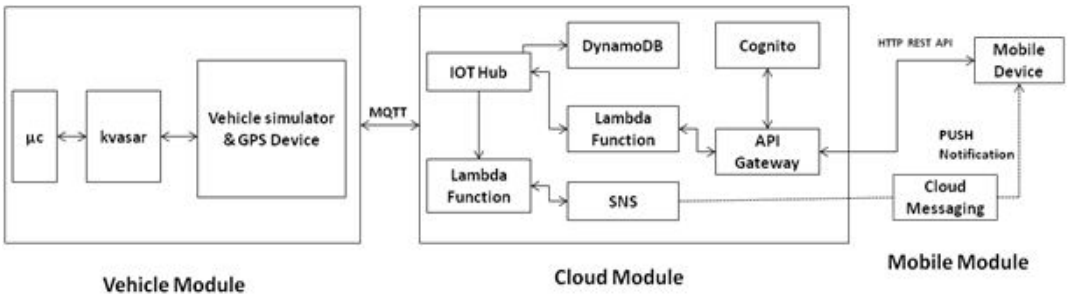

Fig.1 System Architecture

IV. CONCLUSION

Autonomous vehicle communication system is a system which provides communication between user and vehicle allowing automatic parking and pickup facility to user. It uses ADAS Feature for automatic parking. Microcontroller and kvasar is present in the vehicle to send and receive control signals. MQTT protocol and mobile applications are used to establish the overall communication. This communication system can be used to implement driverless vehicles.

REFERENCES

1. Chun Hsiung Chen, C. W. Hsu and C. C. Yao, "A novel design for full automatic parking system," *2012 12th International Conference on ITS Telecommunications*, Taipei, pp. 175-179, 2012.
2. H. r. Dong, S. t. Jin and Z. s. Hou, "Model Free Adaptive Control for automatic car parking systems," *Proceeding of the 11th World Congress on Intelligent Control and Automation*, Shenyang, pp. 1769-1774, 2014.
3. J. K. Suhr and H. G. Jung, "Automatic Parking Space Detection and Tracking for Underground and Indoor Environments," in *IEEE Transactions on Industrial Electronics*, vol. 63, no. 9, pp. 5687-5698, Sept. 2016.
4. F. Weng, P. Angkititrakul, E. E. Shriberg, L. Heck, S. Peters and J. H. L. Hansen, "Conversational In-Vehicle Dialog Systems: The past, present, and future," in *IEEE Signal Processing Magazine*, vol. 33, no. 6, pp. 49-60, Nov. 2016.
5. B. Li, K. Wang and Z. Shao, "Time-Optimal Maneuver Planning in Automatic Parallel Parking Using a Simultaneous Dynamic Optimization Approach," in *IEEE Transactions on Intelligent Transportation Systems*, vol. 17, no. 11, pp. 3263-3274, Nov. 2016.
6. M. Y. Aalsalem and W. Z. Khan, "CampusSense — A smart vehicle parking monitoring and management system using ANPR cameras and android phones," *2017 19th International Conference on Advanced Communication Technology (ICACT)*, pp. 809-815, Bongpyeong , 2017.
7. Lalitha Iyer and Manali Tare, "Android Application for Vehicle Parking System: Park Me," *in International Journal of Innovations &Advancement in Computer Science,*Vol. 3, Issue 3,pp.2347 – 8616 , May 2014.