Internet of things application in mechanical learning in automotive engineering

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Abstract. Internet of Things (IoT) is a technology that uses an internet network that allows control and communication between many objects. The purpose of this paper is to determine the advantages and disadvantages of using the current Internet of Things (IoT) technology and the development of the IoT concept in the automotive field. The method used is a systematic literature review by reviewing journals that discuss IoT-based digital learning media in the automotive field from 2014 to 2019. The results show that IoT-based digital learning media can be used easily in automotive engineering education as a reference for researchers about the application of instructional media engaged in automotive engineering education.

1. Introduction
Given that this IoT is a sophisticated technology that is able to transfer data over a network with easy interaction, the future of its development is very promising. Everyday human life can be optimized and made easy with smart sensors and internet-based smart equipment. IoT can help people in the integration of communication, control, and information processing in various existing transportation systems. The application of IoT is indeed continuously expanding to various aspects of the transportation system. Not only the engine technology, namely vehicles, but also infrastructure, and alluding to the function of the driver / user. The dynamic interactions that occur between the components come from a transportation system. The system allows inter-and intra-vehicle communication, more effective traffic control because it is classified as smart, smarter parking, logistics and fleet management, vehicle control, and also related to safety factors and road assistance.

Automotive is the study of land transportation using machines, especially cars and motorbikes. Automotive began to develop as a branch of science along with the creation of car engines. In its development, cars are increasingly becoming a complex means of transportation consisting of thousands of components belonging to dozens of systems and subsystems. Automotive engineering is a branch of mechanical engineering that studies how to design, manufacture and develop land transportation equipment that uses machinery, especially motorcycles, cars, buses, and trucks. Automotive engineering combines elements of knowledge of mechanics, electricity, electronics, safety, and the environment as well as mathematics, physics, chemistry, biology, and management. Branches of automotive engineering include Planning (product or design), Development (development), Production (manufacturing) and Maintenance (maintenance). In Indonesia, currently, a very developing branch is maintenance and is generally about car and motorcycle maintenance [1].

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The purpose of this paper is to determine the advantages and disadvantages of using the current Internet of Things (IoT) technology and the development of the IoT concept in the automotive field. The method used is a systematic literature review by reviewing journals that discuss IoT-based digital learning media in the automotive field from 2014 to 2019.

2. Method
At this stage selected scientific articles related to IoT Application in Mechanical Learning in Automotive Engineering is published in journals indexed in the Sciendo database and Google Scholar. Other searches were made through the Elsevier, IEEE, IET Journal, Routledge or Taylor, and Francis Online, Springer, and Online Wiley Library databases. A literature search was performed using the keyword "IoT Application in Mechanical Learning in Automotive Engineering". These articles were searched from 2014 to 2019. Based on the search strategy, 20 articles were taken and entered into citation management software such as Mendeley. By doing the PRISMA method, the next step is the automatic removal of duplication by the software. The deletion of duplicates is done, where the same 5 articles have been deleted. Finally, 15 articles remaining after the stage.

3. Results and discussion
Findings from the results of the analysis and synthesis of related articles are presented in this section. Based on systematic reviews and the results of meta-analysis data, IoT is found. Therefore, studies that meet the requirements regarding IoT Application in Mechanical Learning in Automotive Engineering is summarized and classified as follows. This is based on various categories considered in our study for research.

Table 1. Applications IoT in automotive.

| No | IoT Function          | IoT Function                                                                 |
|----|-----------------------|-----------------------------------------------------------------------------|
| 1  | Teknologi WSN [2]     | The IoT application has a large number of smart sensors that can sense objects/objects and the environment. These sensors communicate with the digital world, collecting raw data and forwarding it to the base station. The base station monitors environmental conditions such as temperature, vibration, pressure, and movement and produces information to make important decisions such as controlling the movement of vehicles, military services, traffic monitoring, agriculture, etc. |
| 2  | RTS [2]               | In IoT, context-aware physical objects sense the environment around them and interact with one another. Objects can respond with information used for real-time decision making such as changing lanes safely while driving, automatically turning off lights in a room when no one is around and so on. |
| 3  | RFID [2]              | IoT services are expected to guarantee the security, privacy, and integrity of information and user confidentiality. So the identification and authentication technology needs to be convergent and operated. |
| 4  | Smart Parking [3]     | Smart parking with the help of sensors embedded in cars and city infrastructure can reduce deadlock in parking problems and provide the best quality of service and benefits for citizens. However, several aspects of the design must be properly investigated and analyzed before implementing the solution |

Previous research examines the IoT in the automotive field as in the first study discussing market and technical trends towards Autonomous Vehicles, the evolutionary stage of the car to be fully autonomous, the importance of IoT in driving this industrial ecosystem, the advantages and disadvantages of Autonomous Vehicles, the main problems, and challenges faced by industry, standard activities around
this industry and finally the use case of deployment [4]. Second, present a new system that integrates in-vehicle CAN / OBD networks and IoT networks from wireless devices with an Intelligent Transport System deployed following standards issued by ETSI in the Technical Committee at ITS [5]. Third, discussing low-power automotive technology in the Indonesian Internet of Things (IoT) community, where interaction between cloud information, real-time recognition and control vehicles are the keys [1]. Fourth, real-time monitoring systems that use IoT-based sensors, big data processing, and hybrid prediction models. The proposed model is expected to help managers monitor the status of the assembly line process and to identify errors in the process, thus unexpected losses caused by errors can be prevented. Through this research, we show that integrating IoT-based sensors with large data processing systems is effective for processing and analyzing large numbers of sensor data in real-time. The large data processing system developed in this study uses Apache Kafka, Apache Storm, and NoSQL MongoDB [6].

Fifth, discuss community-based information exchange (CIS) mechanisms to motivate all objects to be involved in sharing traffic events. Specifically, the message processing algorithm and the message generator algorithm is proposed to handle incoming messages originating from other objects and to share new traffic events with others, respectively. Since CIS only uses personal information, e.g. location data, locally, the proposed the mechanism also ensures the privacy of all objects during information sharing [7].

This Literature Review is designed to review the application of IoT in the automotive field. Previous research has noted the use of IoT in the automotive field, but several articles have examined the extent of the role of the IoT in the automotive field. As a result, this review can be seen as one of the most valuable studies in reviewing IoT used in the automotive field. In this review, 10 articles that apply various IotTs can be identified and reviewed from 2014 to 2019.

4. Conclusion

Internet of Things (IoT) helps smooth the connectivity of all vehicles, which not only helps get a better insight into driver behavior but also helps in monitoring the health of the fleet from any device. The increasing demand for fleet safety and data management coupled with the increasing need to reduce total cost of ownership (TCO) and achieve anticipated fuel efficiency to drive the adoption of IoT technology in automotive transportation.

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