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Neural network training for serial multisensor of autonomous vehicle system

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ABSTRACT

This study aims to find the best artificial neural network weight values to be applied to the autonomous vehicle system with ultrasonic multisensor. The implementation of neural network in the system required long time process due to its training process. Therefore, this research is using offline training before implementing to online training by embedding the best network weight values to obtain the outputs faster according to desired targets. Simulink were used to train the system offline. Eight ultrasonic sensors are used on all sides of the vehicle and arranged in a serial multisensory configuration as inputs of neural network. With eight inputs, one sixteen-depth hidden layer, and five outputs, it was trained using the back-propagation algorithm of artificial neural network. By 100000 iterations, the output values and the target values are almost the same, indicating its convergency with minimum of errors. The result of this training is the best weights of the networks. These weight values can be implemented as fixed-weight in online training.

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1. INTRODUCTION

In the recent decade, unmanned transportation has grown in popularity. Several businesses produce goods to demonstrate their latest technology, particularly how their devices can automatically follow the path and fulfil their objectives. Certainly, they will face impediments on the road to their destination that must be avoided in order to avoid mishaps [1]. The system needs sensors placed in it to scan the scenario and conditions around the car in order to recognize items that could become vehicle obstacles. Despite their color and light intensity limitations, cameras and Lidar are increasingly being employed as sensors to detect objects around cars [2]. Radiofrequency radars are also used for this purpose, however they are ineffective in detecting non-metallic items [3].

Due to technical advancements and its range, ultrasonic sensors are thought to be able to replace or improve detection systems to overcome the concerns mentioned above. Ultrasonic sensors have been employed in automobile sensors for a long time, but their employment has been confined to the parking system due to the old technology's short detection distance [4], [5]. Ultrasonic sensors have improved their detection, signal quality, and reliability as a result of substantial advancements in technology. It includes their resistance to light intensity, object color, and climatic parameters [3], [4], [6].

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1	"Foreword from Chair of EECSI 2016", IOP Conference Series: Materials Science and Engineering, 2017 Crossref	12 words — 2%

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