Swarm Driving with Deep Learning

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Abstract—**Swarm driving is a technology that involves multiple autonomous vehicles (AVs) working together to achieve a common goal. Deep learning is a type of machine learning that can enable AVs to make informed decisions based on data from their surroundings. In swarm driving, deep learning can be used to enable AVs to work together as a coordinated team using multi-agent systems or decentralized control in distributed systems. This can improve the efficiency and safety of the swarm. Overall, the use of deep learning in swarm driving can enhance the capabilities of AVs to work together and achieve a common goal.**

Index Terms—**Swarm driving, Deep learning,Platooning.**

I. INTRODUCTION

There has been a long history of swarm-based algorithms used in robotics and autonomous system, and they continue to be used today. The concept of "swarm intelligence" was first proposed by Gerardo Beni and Jing Wang in 1988 as a way of describing cellular robotic systems. This term was chosen by Beni because he had found that the group of cellular robots he was working on had some special characteristics, in fact, they are found in swarms of insects, such as centralized control, lack of synchronicity, and simple and (quasi) identical components. [1] And also Swarm driving is a transportation concept that involves the use of a large number of autonomous vehicles that are coordinated to move as a single unit, or "swarm," in order to achieve a specific goal or objective. This concept has the potential to revolutionize the way we think about transportation, as it could enable the efficient and safe movement of people and goods over long distances.

Deep learning algorithms are ideal for swarm driving applications because they can process large amounts of data and learn to recognize patterns and make decisions based on that data. This enables the swarm's vehicles to adapt to changing environments and respond to new situations in real time. [2] Deep Learning has many advantages, but there are nuances to be aware of, and techniques like Neural Network can be fiddly at times. In this paper, we will look at how Deep Learning techniques can be used in swarm systems to create fast, efficient, and reliable systems that can solve very complex problems. To accomplish this, we will explain what swarm systems are and where they are used in the first section. Following that, in the second and third sections, we will introduce various communication methods and use cases. In the final section, we will discuss the use of Deep Learning in swarm systems, as well as some proposed solutions. Finally, we are going to discuss an implementation of said techniques in a simulation of a swarm system.

II. METHODS

There are several communication methods that can be used to implement swarm-driving technology, including the following:

A. *Vehicle-to-vehicle (V2V) communication*

B. *Vehicle-to-infrastructure (V2I) communication*

C. *Centralized control*

D. *Decentralized control*

III. ALGORITHMS FOR SWARM DRIVING

Multi-agent systems:
Machine learning algorithms:
Optimization algorithms:

IV. USE CASES

V. IMPLEMENTATION IN DEEP LEARNING

VI. SIMULATION

VII. CONCLUSION

VIII. DECLARATION OF ORIGINALITY

I,Md Limon Apu, herewith declare that I have composed the present paper and work by myself and without use of any other than the cited sources and aids. Sentences or parts of sentences quoted literally are marked as such; other references with regard to the statement and scope are indicated by full details of the publications concerned. The paper and work in the same or similar form has not been submitted to any examination body and has not been published. This paper was not yet, even in part, used in another examination or as a course performance.

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