This work has presented and demonstrated some novel algorithms for static and dynamic obstacle avoidance. They have been compared with other famous obstacle avoidance methods as well.

Other research works have presented and demonstrated the capabilities of utilizing OA methods of UGVs for USVs. Implementing UGV methods practically which were developed and validated via simulations, was done as the initiative for the development. It is obviously true that practical experiment results would contradict little bit with the simulation results due to the immaturity of the available hardware. However those obstacle avoidance methods are transformed to achieve a better OA method for USVs.

A good Fuzzy based navigational controller for dynamic model of a USV was developed and it gives results as expected, needed to perform obstacle avoidance algorithms.

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The fuzzy based obstacle avoidance controller is developed and legacy of that fuzzy controller is the algorithm which was developed for emergency collision avoidance of ground vehicles. That algorithm was practically implemented at the beginning of this research. That fuzzy-logic based system gives promising results in simulations. Even though it gives promising results for far away obstacles, the simulation results show that it is not much reliable for low speeds, noises and obstacles which appear suddenly.

Then another novel algorithm was introduced, which is good for low speeds as well as high speeds. That was inherited from the Morphin algorithm of Carnegie Mellon University. The exact details were not published and had to build novel algorithms for that.

The potential field method is used for obstacle avoidance as well since it dominates path planning of robots. Software is utilized for those simulations successfully.

According to the results which are presented in the figures it can be concluded that the novel algorithm is capable of achieving the target with minimum traveling distance. Further all of those algorithms work well and need to be customized more with the situation and application since each and every one is having its own pluses and minuses.

Obstacle avoidance without dynamic obstacles is not functional on in sea. Complete method for dynamic obstacle avoidance is yet to be solved in research field. But some practical dynamic obstacle avoidance methods are being employed today. Moving path prediction of a dynamic obstacle is the biggest problem to be solved by the researchers and two approaches are developed to solve that. RBNN and standard polynomial approximations are chosen as two approaches since RBNN are very famous for function prediction purposes. RBNN and Polynomial approximation methods are employed for path prediction and compared. It can be concluded that RBNN method is good for path prediction purposes because it can be utilized with high noise values as well. A smooth predicted path can be obtained by increasing the spread value of RBNN. A novel dynamic obstacle area prediction method is introduced and it is compared with the conventional velocity obstacle method. Simulation results prove the improvement of the novel method noticeably.

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Three static obstacle avoidance methods and novel dynamic obstacle avoidance method which is inherited from projected obstacle area method presented and simulations done to prove the validity of those methods with sensor noise. The hardware of the USV has to be developed first. Then these algorithms can be employed with those sensors. These algorithms have to be fine tuned. The performance of the USV can improve by utilizing Cutting-edge technology for sensors.

This will lead to an eye opening for USV developers in the Sri Lanka and will be able to fill the gaps of research works on USVs in the world.