MOBILE ROBOT ASSIGNMENT REPORT

COMPACT MOVING EXPLOSIVE DEVICE AS REINFORCEMENT AGAINST TANKS FOR INFANTRIES (UNDERDOG)

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INTRODUCTION

Back in the World War 2, a lot of weapons is introduced by each nation participated in the war. Some of them are technologically advanced like German's U-Boat, and the other is just an efficient approach of doing tasks. One of them is Soviet's *sobaki-istrebiteli tankov*, or Anti-Tank Dogs. These dogs are trained to carry explosives, and released to run after the target, which is tanks for the Soviets. Imperial Japanese Army is also known for using similar approach for attacking bunkers, using dogs given by their German ally, from training facility located at Fort Belvoir (According to article from: Anti-tank dog | Wikipedia).

This method though it seems effective and efficient, it might not be so effective in the literal warzone, since their trainers can't really predict what's going to happen right after they're releasing that "running mines". And now, with advancement technologies, we could fabricate a robot for similar purpose, but of course, with more effective and predictable behaviors. This is why the UNDERDOG comes in, as a cost-effective solution for annihilating opponent's tanks, inspired by the "demolition wolves".

DESIGN

The design process for UNDERDOG Project is done using CoppeliaSIM as its design platform. The design thinking process of this project is to make a way for fabricating cost-effective weapon that can be mass produced and logistically friendly for infantries to even carry it by hand. This product has to be made from the most affordable options of "decent" used least materials to make it compact, lightweight, and cost-efficient.

This design is made using caterpillar wheels available in Locomotive Folder in the CoppeliaSIM Model Browser as its chassis. Shown in the pictures provided below:

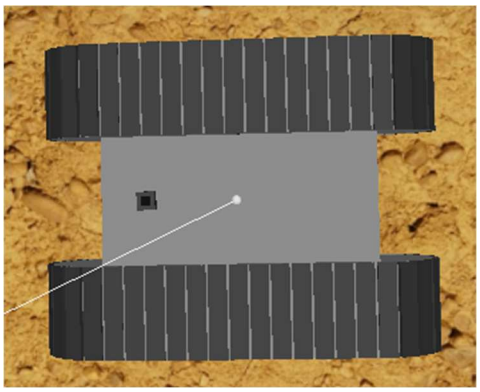

Figure 1 - UNDERDOG Device Top View

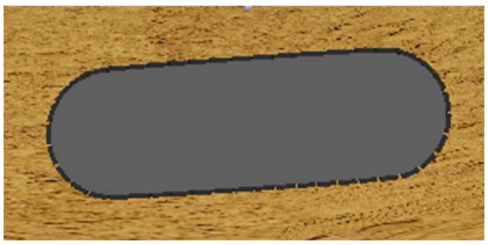

Figure 2 - UNDERDOG Device Side View

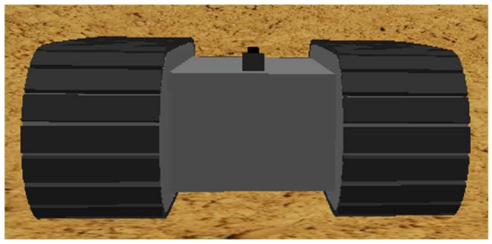

Figure 3 - UNDERDOG Device Front View

Design model of the design is made to be as simple as possible to ease the fabricating process, and with this approach, we have to make the electrics as simple. This device in precise, is equipped with only 4 proximity sensors. 1 on the front, 1 on the left, 1 on the right for detecting object as its “steering mechanism”, and 1 on the top as a trigger of action, which in this case is activating the explosives.

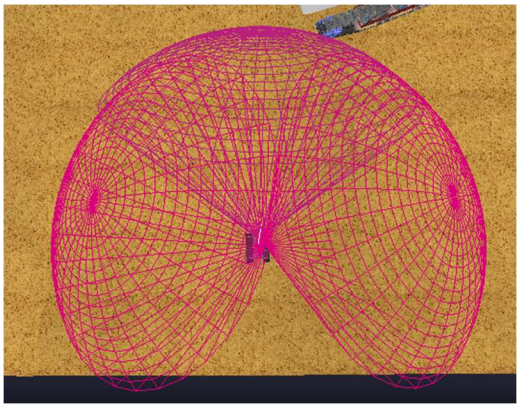

Figure 4 - Equipped Proximity Sensor Modules on the Sides and Front

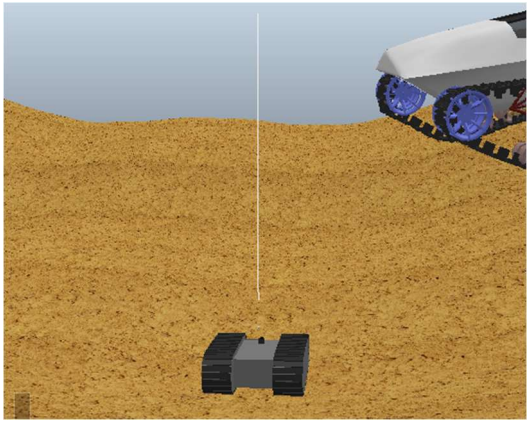

Figure 5 - Equipped Proximity Sensor Module on the Top

The Proximity Sensors on the side and the front is selected with cone-type region of activation with the range of 3 meters each. These 3 sensors are considered enough to control the movement of the device to be able to approach the targeted object quickly and accurately. The back side of the device on the other hand, does not equipped with any sensor. While this is creating a blind spot on the back of the device, it is still acceptable as the device will be launched on the front, toward enemies.

The proximity sensor on the top on the other hand, is selected with straight ray-type region of activation just for detecting the presence of any type of form on top of it that most likely to be the bottom of vehicles in the battlefield. This sensor, if triggered, will activate the explosives carried in the device, and therefore eliminating the target.

APPLICATION

If this device is then to be made for real, it can be used by the infantries by making it moves toward enemies. It will eventually going closer to the targeted object and will chase after it if it manages to escape (which is not likely in the real scenario considering the maneuverability of a heavily armored vehicle).

To simulate similar result, we use CoppeliaSIM to show the behavior of the following device. It is seen to be following the target when the target has got into the detection range of the equipped proximity sensors. As for the trigger sensor located on the top, when it is triggered, it will stop the movement of the device, and start exciting fire as it simulates the explosion in the original design.

As for the algorithm working on the device, when it lit fire, but then the target moved, it will follow it again. But as for the real scenario, both the device and target are more likely to be destroyed and disabled to move.

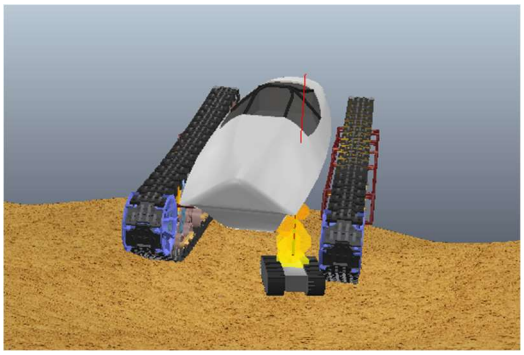

Figure 6 - Explosion Simulated with Fire

CONCLUSION

In conclusion, this project is able to replicate the use of “dog-mines” in the past by delivering destruction right to the face of the opponents armored vehicles, and is more cost-efficient rather than participating in a tank-to-tank combat. We are hoping the future development of this device that could be used as a security device like the domain’s guard for protecting properties and territories like in the conflicted borders or not-yet-cleared domains full of landmines.

ATTACHMENTS

UNDERDOG Simulation Video Using CoppeliaSIM (V-REP):

https://www.youtube.com/watch?v=qnu7ccGzt

Mg**UNDERDOG Scene File**

https://drive.google.com/drive/folders/1F8n_30llKagbo0n6NWgVGM_kCJWIvKk5?usp=sharing