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Predicting Sonar Rocks against Mines Using Machine Learning

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Abstract
Underwater Mine usage by the Naval Defense System provides great Security but also possesses a threat to the marine life and submarine vessels as the mines can be easily mistaken for rocks. So, we need a much more accurate system to predict the object as it is very dangerous if a mistake is made. To have a great accuracy we need more accurate data to generate accurate results. Our idea presents a method for prediction of underwater mines and rocks using Sonar Signals. Sonar Signals are used to record the various frequencies of underwater objects at 60 different angles. We constructed three binary classifier models according to their accuracy. Then, prediction models are used to predict the mine and rock categories. Python and Supervised Machine Learning Classification algorithms are used to construct these prediction models.

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I. Introduction

Underwater mines or naval mines are self-contained explosive devices placed in water to destroy enemies' surface ships or submarines. Underwater mines are used since the mid-19th Century. Sea mines were introduced by David Bushner in 1977 during the American civil war. Previously mines were only activated by physical contact but the newly created mines can be activated by various methods. Modern mines can be activated by acoustic, pressure, and magnetic changes in the water which provoke them to explode. These are called influence mines. Generally, Underwater mines are classified as offensive or defensive warfare. Mines are strewn across hostile shipping lanes in order to damage merchant ships and military boats. Defensive mines are placed along coastlines to divert enemy submarines and ships away from critical locations and into more heavily guarded places. Usually, Mines are mistaken as rocks during their identification, as mines can have the same shape, length, and width as rocks.

Existing Systems

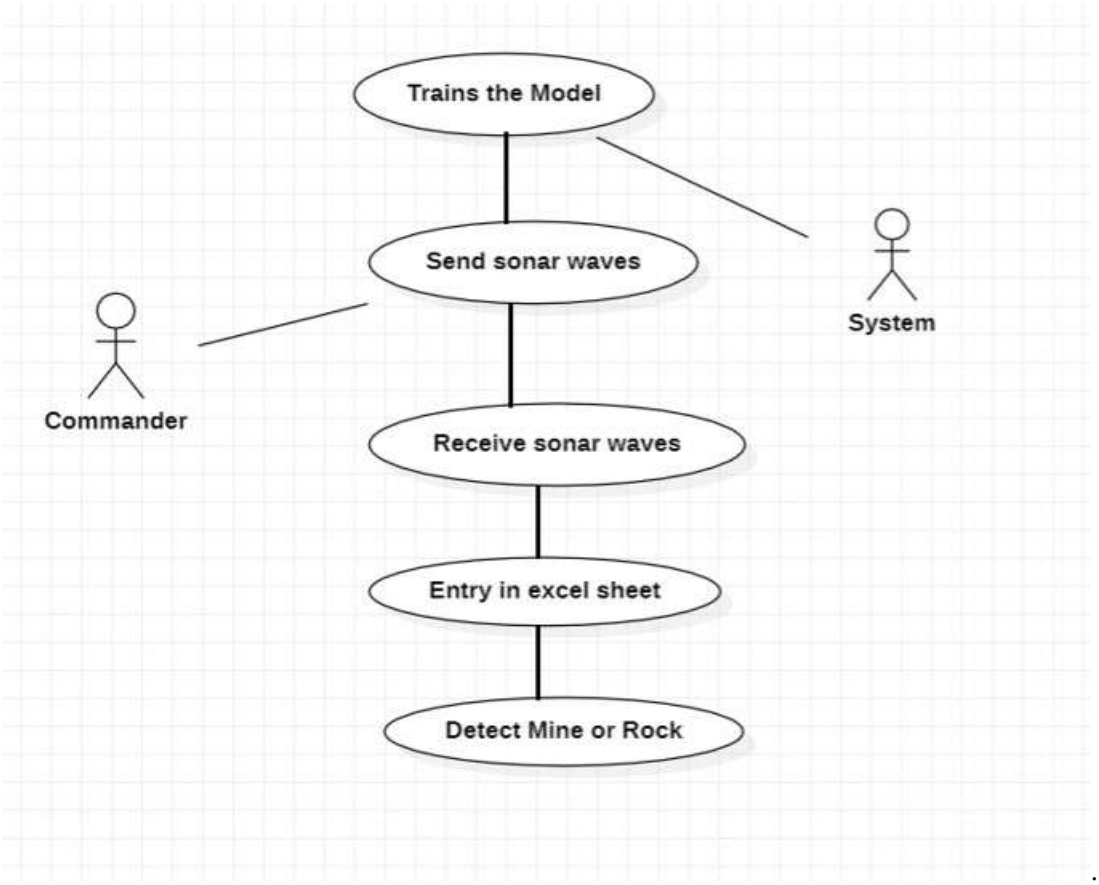
In the existing System ,the detection of mines is done by explosive ordnance disposal divers, marine mammals, video cameras on mine neutralization vehicles, laser systems, etc but not by using a definite data set or equipment which can cause risk and loss to the marine life if it goes wrong. As technology improved sonar being used as a primary tool to detect the mines.

Proposed System

We have proposed a predictive system to give accurate results and outcomes. We utilized the data set from "Analysis of Hidden Units in a Layered Network Trained to Classify Sonar Targets" by R. Paul Gorman and Terrence J. Sejnowski .They employed SONAR to perform trials in a simulated region with metal cylinders in place of mines. The object was struck with sonar signals 60 various angles, and the results were recorded. the data set is then trained to the evaluated models the sonar output frequencies are send into the predictive system as input. We use classification machine learning techniques to predict if the object is a Rock or a Mine .

II. Methodology

The method that we propose is that predict system to give accurate results and outcomes. We utilized the dataset from "Analysis of Hidden Units in a Layered Network Trained to classify Sonar Targets" by R. Paul Gorman and Terrence J. Sejnowski. They employed SONAR to perform trails in a stimulated region with mines. The mines were struck with sonar signals from 60 various angles, and the results were recorded. The dataset is then trained to the evaluated models. The Sonar output Frequencies are sent into the predictive system as input. We use Classification machine learning techniques to predict if the object is a rock or a Mine.


Trains the Model
Send sonar waves
Receive sonar waves
Entry in excel sheet
Detect Mine or Rock
Commander
System

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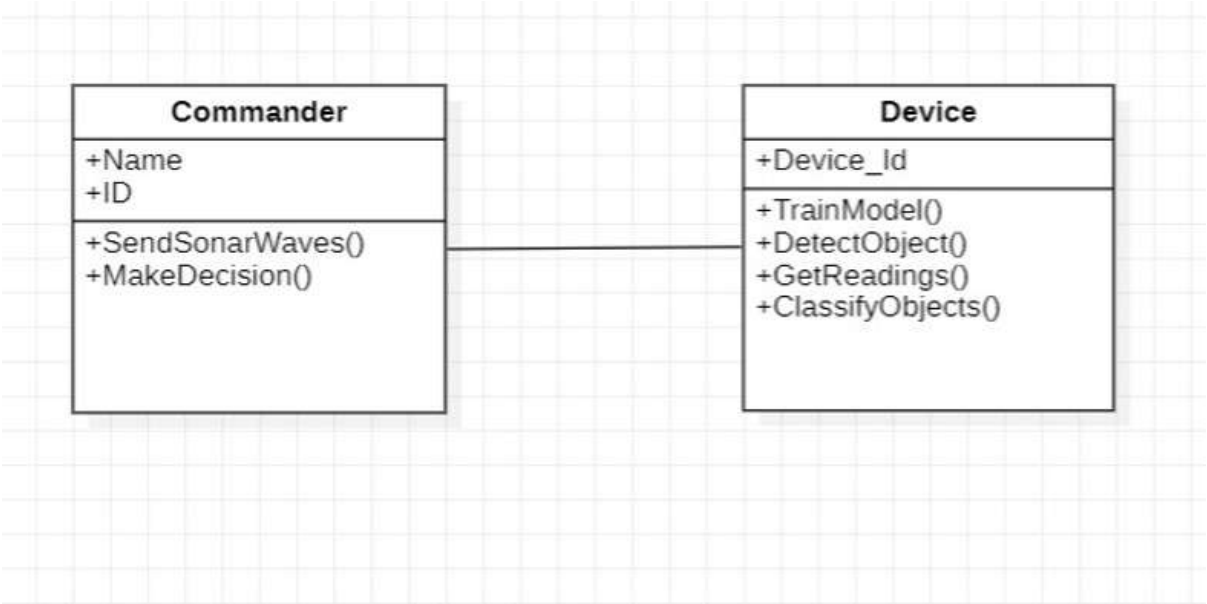
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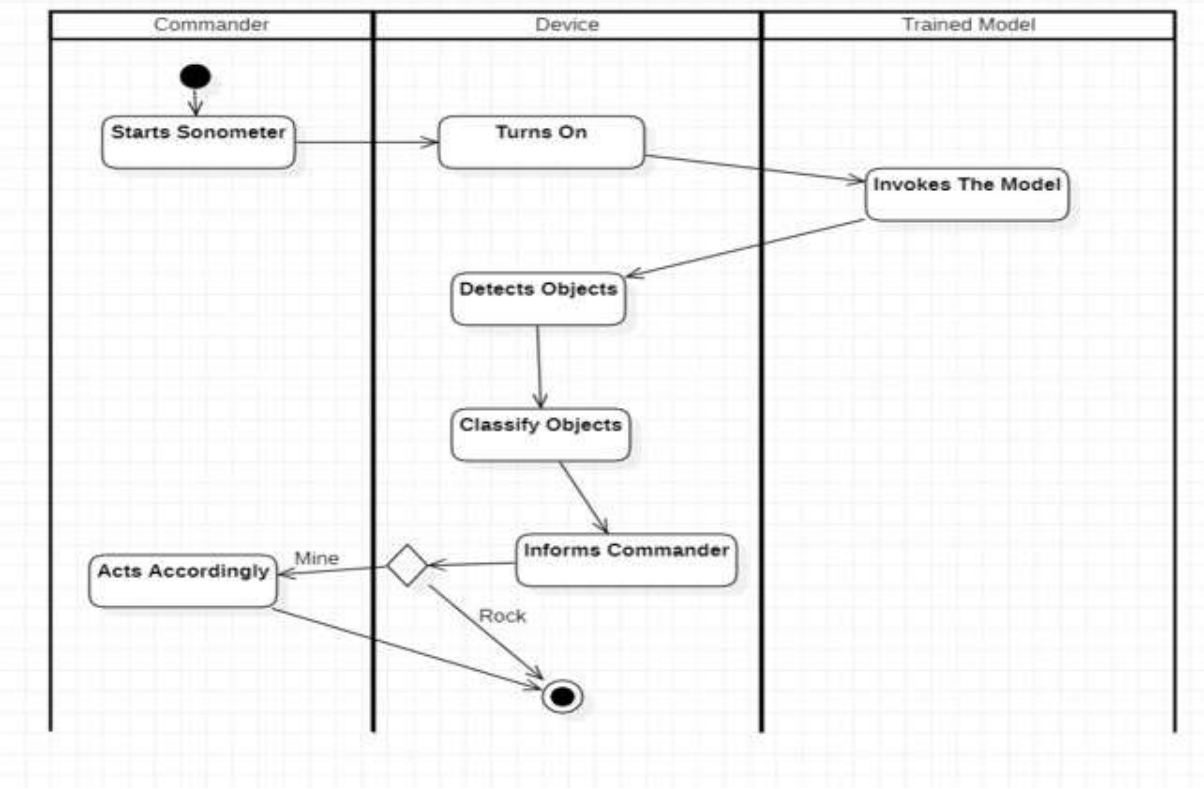

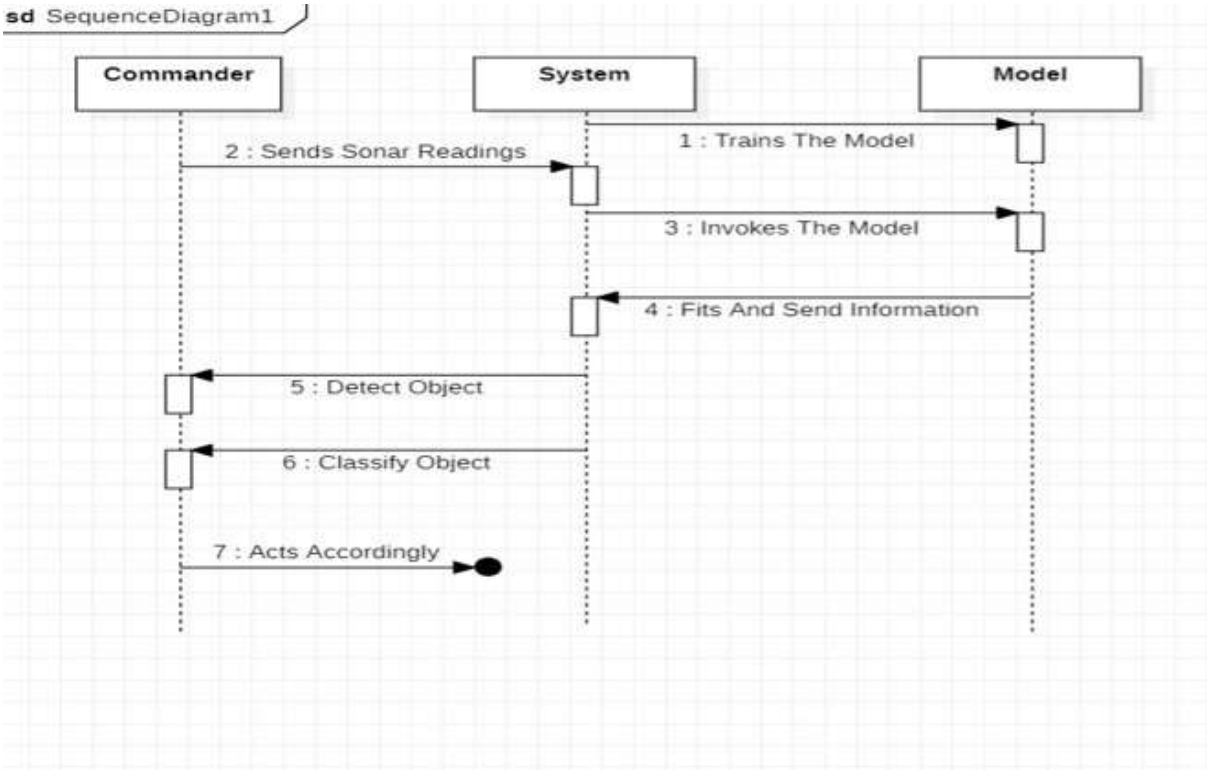

III. Conclusion

Our project "Underwater mine and rock prediction by evaluation of machine learning algorithms" are used to detect rocks and mines in the ocean bed. Naval mines are an effective method for blocking ships and restricting naval operations which result the significant negative economic and environment impacts.There are two existing ways to detect a mine, one by using solar signals and the other by using manpower. Using Solar signals has been better option as the risk for the letter is more. The data is collected stored in a CSV file. By

using different machine learning techniques we can observe and understand the nature of the predictive system. By the evaluation of algorithms, we get to check and compare the accuracies to build a better performing prediction model. A python in open-source software and the machine computation is also faster many others and the cost might decrease dependently .Through this project, we want to make the process a bit easy and simple to achieve and use.

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