

Indian Combat Robotic Soldier

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Abstract: *The project's aim is to model the implementation of the India's very own, very first Combat Robotic Soldier. The reason of having such soldiers in Indian Army is to lower the rate of the deaths of our brave soldiers (referring to Human Soldiers) who usually went to the areas which are fully covered by Terrorists and got shot by them. We have smart drones who can detect the terrorist activities or the unwanted people in any area, but they are not capable enough to stop them or neutralize them, which can be accomplished by this Robotic Soldier. This soldier can get into the Red detected zone/area fearlessly and can neutralize those terrorists. On the other hand, our army soldiers (Human soldiers) on the base can monitor the movements and the whatever activities the cameras on the robotic soldier will capture. The whole system is designed is based on the combination of Deep learning and the Neural Networks. The whole idea is based for the soldier who are protecting our nation INDIA by standing at the borders and deals with daily's vigorous shoot-out with the terrorists or with the other nation's army soldiers very bravely.*

Keywords: Indian, Combat, Robotic, Soldier, Deep learning, Neural Networks

1. INTRODUCTION

Robot is a term which refers to the machine that is programmatically designed to accomplish the numerous tasks. In other words, it can be referred as Supervised or an Un-Supervised machine. Supervised machines are the robots which can be controlled manually and are also always gets monitored by the some supervisors whereas an Un-Supervised machines are the robots which are capable to make decisions by sensing its environment and perform actions accordingly in the real-world scenarios, and they don't need any supervisor to control and monitor their movements. An Unsupervised Robot works on 3 main principles, i.e., Sense, Compute and Action.

There are various types of robots that are varying in the technologies that they are working on. Some are designed to perform only one single task; they are known as Pre-programmed or Monotonous Robots.

Then there is another type of Robot known as Teleoperated Robots, which are controlled by humans to access to the places where humans cannot reach to the extreme conditions like: submarines to fix underwater pipe leakage.

There are many more types of Robots like: Autonomous Robots, Augmenting Robots, Humanoid Robots, etc. These robots work on different and advanced technology with number of sensors to sense its environment.

Sensors are the devices that are used to sense or detect the presence and the movement of any object or material in real-world. Sensors are designed to take some inputs from the real world and then compute those inputs and finally generate the suitable output, which ultimately helps the world to get some ease in their life.

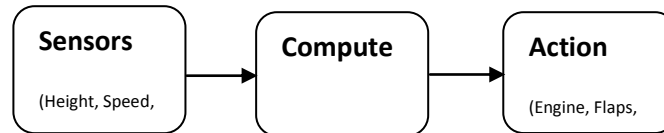


Fig 1 : Elements for Autonomous Robots

There are various types of sensors like: **Proximity Sensor** (to detect the presence of any object), **Rain Sensors** (to detect the sprinkling of water droplets), **Smoke Sensors** (to detect the presence of smoke at a certain level), **Beacon Sensor** (is generally used to sense the angle at which the object is placed). Similarly, there are many more sensors like: **IR Sensor**, **Thermistor**, **Ultrasonic Sensor**, **Touch Sensor**, **Pressure Sensor**.

2. LITERATURE OVERVIEW

As we know that there are various types of robots already exists. But among all of them, some functions with the help of some or the other assistance and some functions in a way that they must perform only single and a very basic type of task.

But till date we don't have any such robot who can take decisions on the basis of its environment and can take decisions on its own in the real battlefield or say who can act as a combat soldier which can fight at the front line in the battlefield without being defeated and has a capability to get down or shoot all of its enemies.

We already know about many robots that are already serving their nations in some or the other way. Some examples like: From the very latest scenario, the Government Hospital in Chennai had introduced a Robotic Nurse for serving the Food and medications to the patients who are infected from the global coronavirus and are admitted in the COVID-19 Ward, to minimize the number of interaction between the health worker and the patients.

Similarly, there are many more examples available like: Drones, are also termed as a robot which is designed and programmed to only capture images from different angles (i.e., almost 360° and deliver it to its receiving station.

Another example is from United States, a General Atomics MQ-1 Predator which is an unmanned combat aerial vehicle. It was introduced in 1995 for dropping missiles on the enemy forces while in the battlefield, but all its functioning was controlled remotely. But unfortunately, the predator was retired in the year 2018 by the USAF (United States Air Force).

An autonomous robot serves various advantages also. Some of them are:

- Increase efficiency and productivity

- Reduce error, re-work, and risk rates
- Improve safety of people in high-risk work environments
- Perform lower value, mundane tasks so humans can work collaboratively to focus on more strategic efforts that cannot be automated
- Enhance revenue by improving perfect order fulfilment rates, delivery speed, and ultimately, customer satisfaction

It can detect the presence of a weapon using image classifier and object detection. And can identify an enemy with the help of Face-detection technology.

3. SYSTEM MODEL

There are various scenarios in which this type of robot can perform and showcase its talent & its efficiency. But there are some common features that each type of robotic soldier is equipped with. These are:

1. Cameras:

Every robot will be equipped with following cameras and goggles, such as:

- Sight Vision : 600TVL 170 degree Mini FPV AV Camera with Audio
- Night Vision : Armsight Nyx-7 Pro 3, Alpha Gen 3
- Thermal Vision : Valken V-TAC Tango Thermal lens Goggles

2. Solar Panels:

The solar panels are required to keep the robot full charged always. The panels will work same as it works for other purposes.

3. Tele-Communication:

For transferring data about the battlefield to the reporting station to keep the commanders updated about the situation of the war at the border. This can be achieved via Satellite calls, so that they can communicate with the base even from the out-of-network area.

4. Chat-Box:

A chat-box is required to ask for the permission from their Commander-In-Chief to open-fire or to move a step into the enemy's cage for action.

5. Image Detection Device:

An image detection device is required to detect whether a person / enemy soldier is carrying any weapon (like gun, sniper, grenade or any bomb, etc.) or not and then to identify the details of the weapon that is detected to take the necessary action accordingly.

6. Sensors:

- Proximity Sensor : for detecting presence of objects
- Beacon Sensor : for detecting the angle of object
- PIR Sensor : for detecting a motion
- PMD Sensor : for measure the distance using Laser

7. Suit Material:

Suit is designed by using Wolverine cloth-fabric which has the capability to heal itself very quickly. And it can stretch 50 times of its length

Now, let's see to the various roles in which this soldier can perform.

1. Snipers:

A Sniper Robot's sight camera firstly examines the site where the enemies are expected (like in a room, inside a vehicle) through Thermal lens and PIR Sensors.

Once the number of enemies and their positions are known, then a sniper can aim and shoot its target(s) with 100% accuracy.

2. Front-line Warrior:

A front-line warrior Robot firstly check for the enemy's uniform and the country logo on his uniform, and then using the Image Detection it starts the process to check whether that logo is matching with his own country's logo or not.

If matching gets successful, Not-to-Shoot is the command which he has to follow, but if the match gets unsuccessful, then Shoot and Kill is the command which he has to follow and shoot the person (i.e., enemy).

3. In-City Soldier:

An In-City Robotic Soldier cannot shoot anybody without getting 100% assured that the person he is shooting is harmful and dangerous for the country.

So, such robotic soldier is designed that it must follow the following model i.e.,

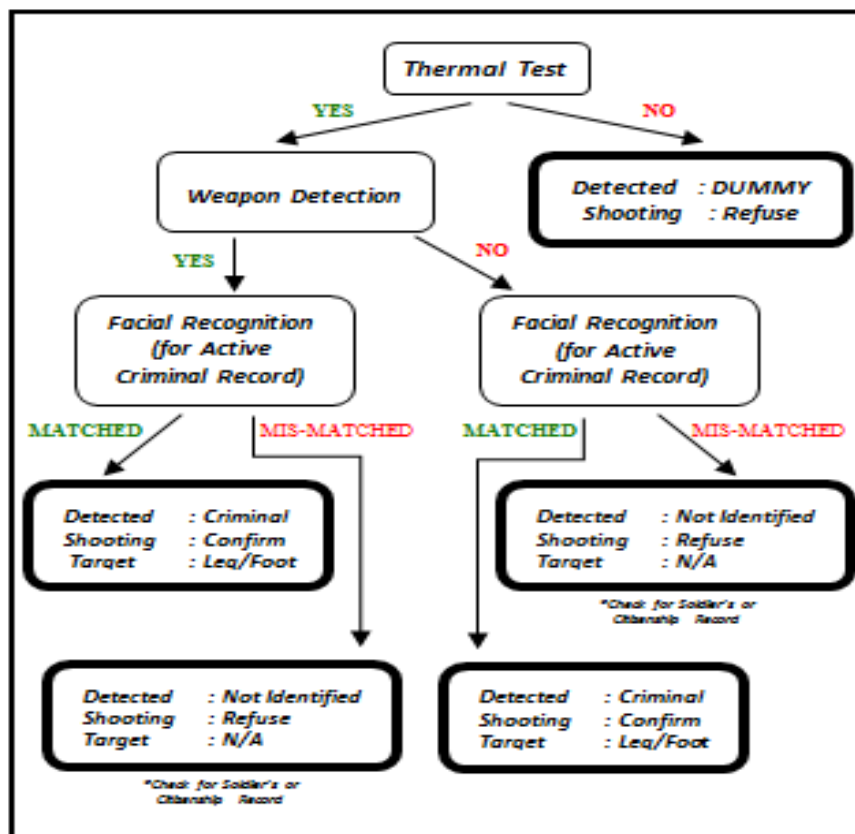


Fig 2 : System Model

According to the model, a Robotic Soldier firstly checks whether the material is Human or not using Thermal lens goggles. There is a heat present in a human body which is represented as 'red' and any other material does not carry any heat which is represented as 'blue'.

If the Thermal test comes out to be negative, then it is detected that the material is not a human but a Dummy or Mannequin and there is no need to release fire. But if the Thermal test comes out to be positive, then it becomes necessary for the soldier to check whether a person is carrying any weapon or not along with him. For that an Image detection technology comes in picture. A system is designed with various picture of most of the weapons the terrorists / killers mostly use. Then the system scans the human body for detecting the weapon, whether a weapon is detected or not, the system has to check for the Facial Recognition Test to check whether a person is having any "Criminal Record" or is tend to be arrested and present in the "Most wanted Criminal List" with the same Image detection technology that we will be using for Weapon detection. As per the data matched or mis-matched for the facial recognition of the person there are various action that the robot is designed to perform like: ***Detected, Shoot, Target.***

If there is no weapon detected but an Active Most-Wanted Criminal Record is found against that person, then the Robot must allowed to release a fire on his leg/foot, so that he can't run away from the site and the Robot will contact to its base station about the situation and the base station will take further action to whether to arrest the criminal alive or command the robot to shoot him on the criminal's head.

4. Fire Fighter:

Sometimes it happens in fire accidents, if there are humans got stuck in the fire, then there is a lot of pressure on the fire-fighters to save those people who got stuck in the accident for which they are trained for.

But sometimes the situation gets so worse that when they go inside the fire to protect those people even, they get stuck because of some mis-happening which ultimately results in the death of those fire-fighters.

But this Robotic soldier can save every life in a very minimal time and it makes sure that there is no life-loss in the accident because of them. And as it is equipped with the wolverine fabric cloth material which is much fire-resistant fabric

5. Military Doctor:

A soldier with combat skills as well as medical knowledge is more than the best soldier, a force can have. Because if there comes a situation where a human soldier needs an urgent medication in between the war where human soldiers are also required to fight, in such situation this type of robotic soldier can give an necessary treatment to the soldier without wasting any time.

4. RESEARCH FINDINGS

This research paper is based on the Image Detection of the Weapon and the Facial Recognition to identify the criminal or the intruder who is harmful for the country.

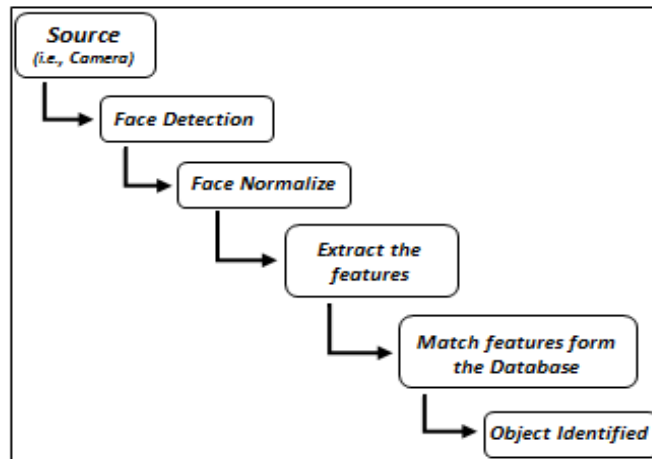


Fig 3 : Process of Facial Recognition System

As it is shown in the figure, the Facial Recognition System process having various phases for Image detection. The same Process is followed for Weapon Detection.

○ **Phase 1 : Source**

In the first phase the system will capture few images of the object to be detected using its Vision cameras. The images are captured despite of their graphics techniques – scale, rotation and translation.

Yes, facial expressions, beard style, hairstyle such features are still a problem with the existing systems. But here comes the second phase to solve such problem.

○ **Phase 2 : Detect the Image**

In this phase, the system based on the anthropometric information or data of the human body anticipate the approx. positions of the various face features like: Eyes, Nose, Mouth, Ears. These all are for detecting Face Recognition.

But for Weapon detection and recognition, the dimensions of the weapon that an enemy is carrying or holding, or it is lying somewhere on the ground or table is enough to identify the model of the weapon and its maximum shooting range. Once the images are captured, then the images get normalized.

○ **Phase 3 : Image Normalize**

In the third phase, the image normalization process gets initiated, where the images of same type or same group of images are listed together and form a group. This makes the matching process much easier for the system without taking much time.

○ **Phase 4 : Extract the Features**

This phase is asked to extract all the features of the object whether it is a face for Face detection or the weapon for the Weapon Detection.

The features required for Face detection are listed below:

1. **Face Shape**
2. **Skin Color**
3. **Eyes**
 - Shape

- Color
- distance between the eyes
- 4. **Nose**
 - Size & Shape
- 5. **Mouth**
 - Size & Shape
- 6. **Ears**
 - Size & Shape
- 7. **Facial Hair Style**
- 8. **Height** : required to check for any Active Criminal record)
- 9. **Body Shape** : required to check for any Active Criminal record)
- 10. **Any facial accessory** : Glasses/Goggles, Ear-rings, Nose rings, nose-pins, tattoos, mole, any mark, etc.

And the features that are required for Weapon Detection are:

1. **Shape of the Weapon**
2. **Dimensions of the Weapon**
3. **Attachments** : Scope, Suppressor, Compensator

○ **Phase 5 : Match features form the Database**

In phase 5, after collecting all the necessary details of the features of the object, its time to match all the details with details that are stored in the Database to identify the object whether it is Facial features to recognize a person or the weapons features to recognize the weapon and its detailed stats.

○ **Phase 6 : Object Identified**

Finally, we have identified an object i.e., a human being or a weapon.

5. RESULT

As a result, we have our very own and very first an “Indian Robotic Soldier”, which ultimately saves our soldiers’ lives from the unnecessary attacks or shoot-out.

And moreover, this robotic soldier has an ability to shoot an enemy with a maximum accuracy with its aim and shoot training module, which stores an information to how to aim and release a fire, firing range of the weapon, how to reload a weapon, etc.

Ultimately it will look alike a human Indian soldier and perform as a normal soldier, but with various training modules and helps the soldiers at the base station to provide the time to time updates about the field without having any fear to get shot.

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