Project Augmentation for Negating Enemy Projectile

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***Abstract*— This article contains possible methodologies that be used to overcome the disadvantages of using flares as a counter measure for heat seeking missiles, the main objective of the proposed system is to outwit the enemy missile by enhancing it,s heat signature when compared to that of the after burner heat coming out of the aircraft. This decoy missile will be launched by the friendly plane (F-plane) when the enemy missile is detected. The approaching enemy missile will start seeking the heat signature of the decoy missile instead of F-plane and gets deviated.**

Keywords—Missile guidance systems, heat seeking, electronic guidance and control systems.

I. INTRODUCTION

Project augmentation for negating enemy projectile (PRAXEP) is an anti-missile guidance system whose purpose is negating the enemy the chance to strike at our defense assets be it –air naval or land base. PRAXEP is a defense system that uses superior electronics and artificial intelligence (AI) and onboard computers to control the flight, speed and direction of the anti-missile system.

The proposed system is more concerned about heat seeking missile. Heat seeking missile when launched will track the heat signature of the target plane and destroys it. Conventionally flares or shafts are used to outwit this heat seeking missiles. But these missiles are designed in such a way that no other heat source can outman oeuvre them. This is due to their advanced artificial intelligence and guidance systems. Hence in the military scenario it has become a necessarily to develop or design a counter measure which can deceive these heat seeking missile and also overcome the drawbacks of the conventional flare system.

II. CURRENT MISSILE GUIDENCE SYSTEM

There are several missile guidance and control systems based on different principles [3] and they are

A. Homing Guidance

There are three types [3]

- Active homing – Radar is incorporated (emitter and receiver).
- Semi-active homing – Emitter is in the base and receiver is in the missile.
- Passive homing – Missile seeks the heat generated by the target

Fig. 1. Homing guidance model

B. Remote Control

Command to line of sight- this guidance system uses the line of sight to track the target and the same is used to control the missile and to hit it. Command off line of sight- this system uses radar and can track the target even beyond the line of sight.

Line of sight beam riding guidance- this hold goods for short range targeting, here a beam is used to point the target and the missile follows it.

C. Go onto location in space guidance

This uses inertial and GPS guidance systems, to obtain a precise location information by which the weapon that is, the

missile senses this location. This system is mainly used for ballistic missiles which are armed with nuclear weapons.

Go onto target systems are divided into three subsystem:

- Target tracker
- Missile tracker
- Guidance computer

These subsystem interacts with the missile and the launcher to give out the results.

III. PROPOSED SYSTEM

When we consider the conventional flared defense system as mentioned earlier uses a flare or a shaff which is a aerial infrared countermeasure defense system. This is used in military planes as a part of the defensive technique to counter an infrared homing (‘heat seeking”) surface to air missile or air to air missile.

When a heat seeking missile is about to hit the target as a defense mechanism the pilot releases the flares which are nothing but heated aluminum with a sufficient enhancement of the heat signature to distract the enemy heat seeking missile that is supposed to lead away enemy missile from the target aircraft.

The main disadvantage of flares is that they cannot outwit the enemy missile as the intelligence system used in the enemy missile can distinguish the flares.

A. Theory of praxep

PRAXEP has the outmaneuvering capabilities which is an important feature hence probing it to be better than conventional flare systems. This missile guidance system can handle BVR missiles (heat sinking). The proposed system has visual as well as temperature reading features installed in it to provide accurate results.

B. Antimissile system beyond visual range(praxep)

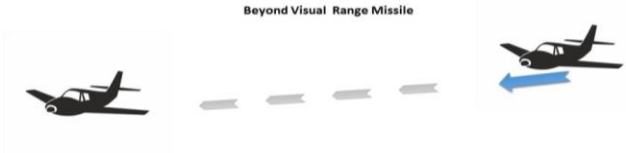

Fig. 2. BVR Missile

On board signal systems alert the pilot about the emerging air to air BVR missile launch. The F plane detaches the decoy missile. After the launch of the decoy missile the F plane heat signature must be reduced drastically. Now the missile provides an enhanced heat signature than the plane. The enemy missile follow the heat signature of the launched missile rather than following the plane, henceforth safeguarding of the F Plane is successful. This missile can electronically depict the heat signature of the enemy missile by taking a loop and strike the launch source.

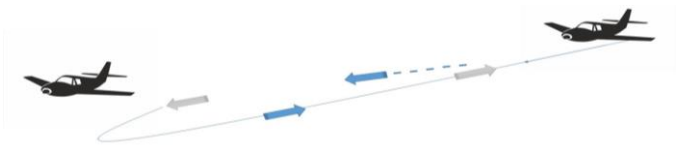

Fig. 3. Enemy missile and Decoy missile

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IV. COMPONENTS AND WORKING

Three robots are used to demonstrate the concept. Out of three robots one will be the F-plane and other two will be decoy and enemy missile robots. Microcontroller used in these robots are Arduino UNO and it is based on ATmega328.

A servomotor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. This servomotor is placed in enemy missile and with IR sensor fixed.

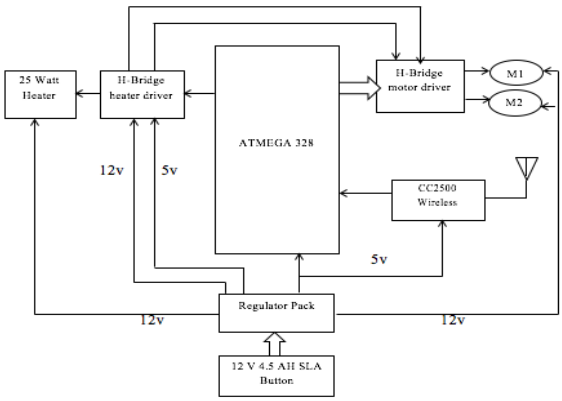

Fig. 4. Block diagram of the plane

IR sensors detects temperature of two-dimensional area: 8*8 (64 pixels). Servo motor has 100^0angle of rotation that is from 0^0(centre), 50^0left and 50^0right. The decoy missile will be attached or plugged to F-plane through remote control it will be detached when the enemy missile is detected. CC2500 wireless module is an FSK Transceiver and the chipcon IC (CC2500) is used for design Single chip based transceiver. And this design is used for wireless control in the system.

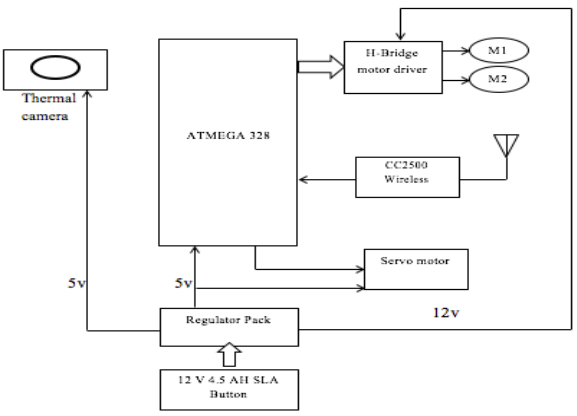

Fig. 5. Block diagram of the enemy missile

F-plane has a coil with less temperature when heated. The Decoy missile robot has a copper coil which will be heated to higher temperature.

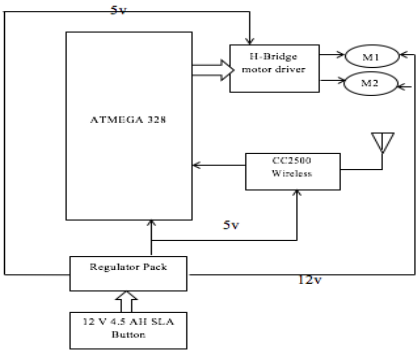

Fig. 6. Block diagram of decoy missile

V. RESULTS

The entire system was implemented on ground . the enemy missile body is provided with a heat seeking camera of a thermal camera and it constantly monitors for the heat signature from any other body. As soon as the thermal camera detects heat from the missile it mistakes the decoy missile to be the plane and follows it, irrespectively that is now the enemy missile is locked on to the enhanced heat signature of the decoy missile.

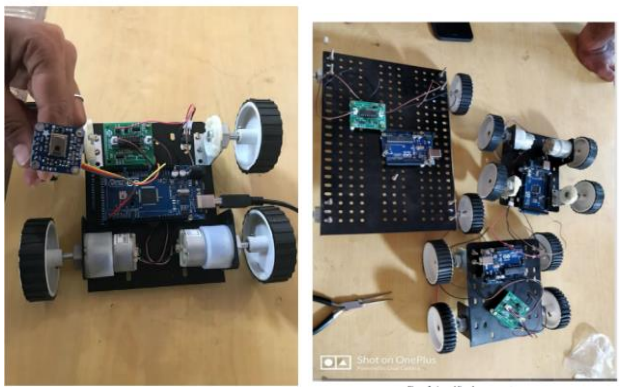

Fig. 7. Final assembly

The temperature of the decoy missile is constantly measured and the flight is made to move. The heat signature of the decoy missile is raised upto 40ºC and the enemy missile is detached and made to move and now the enemy follow s it . The thermal camera can monitor around 90º radius and it makes the motor move accordingly . The table below shows the direction of movement with respect to the heat signature.

TABLE I. ANGLE AND THE DIRECTION SOUGHT BY THE ENEMY MISSILE

SL No	Servo motor angle	Direction
1	0 to 30	Left
2	30 to 60	Forward
3	60 to 90	Right

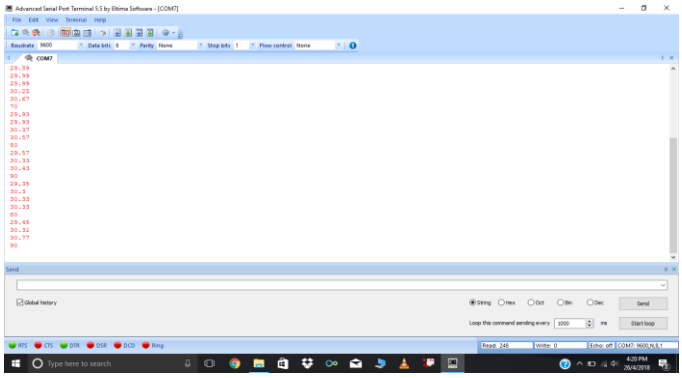

Fig. 8. Output from the thermal camera

VI. CONCLUSION , SUMMARY AND FUTURE WORK

This system in future can not only be used as a countermeasure to safeguard our F plane but also can be used as a counter attack system to make the heat seeking missile to strike back on its own launch pad using its own principle that is, following the heat signature. Hence proving to be an effective way to prevent air strike on our aircraft such a way the enemy thinks twice before launching the next heat seeking missile. The current intention of the proposed system is to avoid the heat seeking missile to hit the aircraft during an air attack in the war and therefore saving a lot of money for the defense most importantly it will save the pilots life. This can not only be used for defense in military purpose also, can be a main countermeasure for civil aircrafts. The final implementation step of this system is to monitor this electronic guidance system for on air purpose checking the behavior of this missile guidance system on air considering the aviation, guidance laws and propulsion.

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