Multi Warhead Multi Shells System (MWMSS) of Missile Defense System

Shibu Debnath Ovi[1*], Rajib Mondal[1], Ayesha Siddika[2]

[1]Instructor of Computer Department, CCER Polytechnic Institute, Narayangonj, Bangladesh

[2]Department of Computer Science and Engineering, World University of Bangladesh, 17 Uttara, Dhaka 1230, Bangladesh

*Corresponding author

doi: https://doi.org/10.21467/proceedings.123.11

ABSTRACT

This project aims to develop missile systems & systematic analysis of Missile guidance and control. Disclose to some systems which develop limitation and according to a few methods. In this paper, Discussion about this method and we convert this method to algorithm. This system have designed for ensure highly intelligent activists of the missile system. Missile systems depend on software based automatic systems and this software follows some systematic intelligence algorithm. So, algorithm & technical steps affect this main Missile guidance & controlling system. Following the Spiral model for the entire project work. Project manager employ of this model for the design, project planning, system implementation and achievement of their project goals. We describe our analysis, problem detection from real phenomena & these problems have solved by new designs & new development analytical systems. We have described our plans and have detected problems for the solution from these phenomena. It works with the Main Missile Guidance and Control System. This is called, Multi Warhead Multi Shell System (MWMSS). In simple terms, have some multiple mini missiles set in big missiles. Main Missile Guidance and Control System works main activities and this MWMSS adds a special advantage.

Keywords: MWMSS, Multi Warhead Multi Shell System, Phenomena

1 Introduction

At present, Missile systems play a very important role in war grounds. But there are some limitations in the missile system. Our project aims for develop missile systems & systematic analysis to Missile guidance and control. We have described some systems which develop that limitation and according to a few methods. In this paper, Discussion about this method and we convert this method to algorithm. In our system analysis steps, we will be showing limitations, removal of limitations, advantages of the new methods, applying methods to removal of limitations, the effects on missile systems by methods, difference between past systems & new systems which according to these methods, respectively.

Objectives

This system is designed for ensure highly intelligent activists of the missile system.

a. To ensure major problems of some phenomena and indicate problems from phenomena.

b. To introduce a new system concept for missile guidance and controlling systems

Proceedings DOI: 10.21467/proceedings.123; Series: AIJR Proceedings; ISSN: 2582-3922; ISBN: 978-81-954993-5-9

Scope of Study

This thesis study is completely based on missile development activities. Missile systems depend on software based systems and this software follows some systematic algorithm. This project devolved all elements of the missile system. So, this algorithm & technical steps affect this Missile guidance & controlling system. This study can apply to Air Defense, military defense, naval defense. This study will be showing, how systematic devolvement of missile guidance and technical directions.

2 Literature Reviews

Over the last 30 years, there have been many studies about missile guidance & control system. This result has been a perfect sign of overcome and several approaches to the problem have emerged. Airframe & motion of missile have development by identify problems. In this sector, very challenging part is essential model development for missile. The central of the missile system is guidance activities. Guidance system plays the vital role in modern missile devolvement. [1]

In the investigation, related to indicate the feasibility of an integral-rocket ramjet (IRSFRJ) engine which low-cost, high speed, caseless, solid-fuel and has no ejecta (fuel & air mixing chamber) system. Ramjet powered ASM's systematical design capable of being fired from a guided system and aircraft which was using computer programs perfectly. Vector Ramjet's transition was demonstrated which burning and ignition system to be insensitive to the booster tail-off to vector air-injection timing sequence. The main aim of this project work was to demonstrate the feasibility of using an integral solid-fuel ramjet engine (IRSFRJ) to power an ASM capable of being launched. There are many causes for holding to increase the path range and velocities of current ASM which fired from RPV's and Aircraft. Historically, rocket motors of ASM have been powered by solid fuel propellant. In this system, there are simple, reliable and inexpensive rocket motor. [5]

This paper is to presenting the special ability of a perfect predictive numerical environment, updated for multidisciplinary design optimization (MDO) purposes, which shows one more contribution in cases of numerical modeling for fluid–structure interaction (FSI). There are many available experimental records, it were contained mostly for calibration purposes, have been used for computational fluid dynamics (CFD) and computational structural mechanics (CSM) validation and verification. The method in numerical optimization, procedure was applied on the short range surface to surface ballistic missile fin configuration. This fin configuration effects on the missile aerodynamic structural system. [2]

This book based on perfect design procedures to air and missile defense Engineering. It show results in a balanced missile defense system (Ballistic and Static). It requirements are to perfect defense of ballistic missile needs. According to this organization of modern defense systems will provide the fundamental technical foundation for missile defense engineers, because it direction an organized program, defense technical analyses. It will effectively guide the systematical and technical definition, research investment and development efforts for next generations of ballistic or non- ballistic missile defense systems. This organization upgrades to existing missile defense systems and defense programs. The main view of these to provide define of the physics of missile defense systems and the main performance parameters that drive the capabilities of these systems. [3]

Proceedings DOI: 10.21467/proceedings.123
ISBN: 978-81-954993-5-9

Series: AIJR Proceedings
ISSN: 2582-3922

View of visual simulate is a major part of any system development cycle. Showing the characteristics records of the chosen physical system or process is first necessitates that a model to be upgraded. It represents the system itself but in a simpler characteristics to avoid the high complexity. [5]

Rocket Propulsion is a one kind of jet propulsion system which produces thrust by ejecting stored matter called propellant. This system consist by a jet engine rocket that uses solid propellants (fuel and oxidizer). Any kind of simple solid fuel jet rocket motor consists by a chamber/casing, nozzle, grain (propellant charge), and igniter. Now a days, rockets use oxidizer (Aluminium perchlorate), fuel (Aluminium) and fuel binder (HTPB) and curative catalyst (Iso-foron-disocyanat). [6]

The system of aircraft manoeuvres is major part of aircraft flight & fight. Air combat tactical plays high manoeuvre situation in dog fight. Any kind of missile & fighter jets are following this manoeuvring system. In this book, introduce many aircraft gun. Any kind of air defense technic depend on this manoeuvring system. [7]

The major and vital importance of air defense systems deployed forward, near the launch base areas of hostile ballistic missiles. It analysis in the 1960s when ballistic missiles defense system were 1st deployed. It named is Nike X. At last it led to the Sentinel and Safeguard co-programs and evolved from air defense missiles. These were deemed the higher realistic solution to defense for continental United States (CONUS). It consisted by multi radar-command-guided Spartan area interceptors designed, which engage threats above the atmosphere and high attitude. This upgraded radar-command-guided Sprint terminal interceptors are very high acceleration that were launched after atmospheric filtering of light decoys. By systematical virtue of the use of onboard data gathering, the homing guidance system provides continually improving quality of target information right up to the intercept point. More than any single generating device, the guided missile has shaped the aerospace forces of the world today. [9]

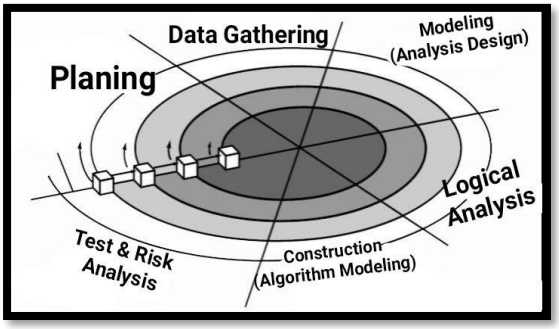
In the defense and combat field, human Shoulder Launched Infantry Weapon Systems (SLWS) uses Solid fuel rocket motors. The characterized of (SLWS) is a very short burning time, high-pressure combustion and a wide spectrum of design solutions for rocket motor structure. Interior ballistic behavior of such rocket motors depends on many factors such as design structure, propellant grain shape, and propellant grain joint to the rocket motor case, type and location of the igniter, spinning mode and nozzle design. [13]

Radar homing missiles or Radar homing guided system are very important in the missile defense system around the world for at least 3 decade. The radar homing guidance has two major advantages, at 1st, the missile basically sure to guide itself towards impact with the target. 2nd, that radar has the ability to overcome natural effect as rain, smoke, and dust etc. The vital goal of this project is to input this information sufficiently for the benefit of engineers working in this defense sector. [11]

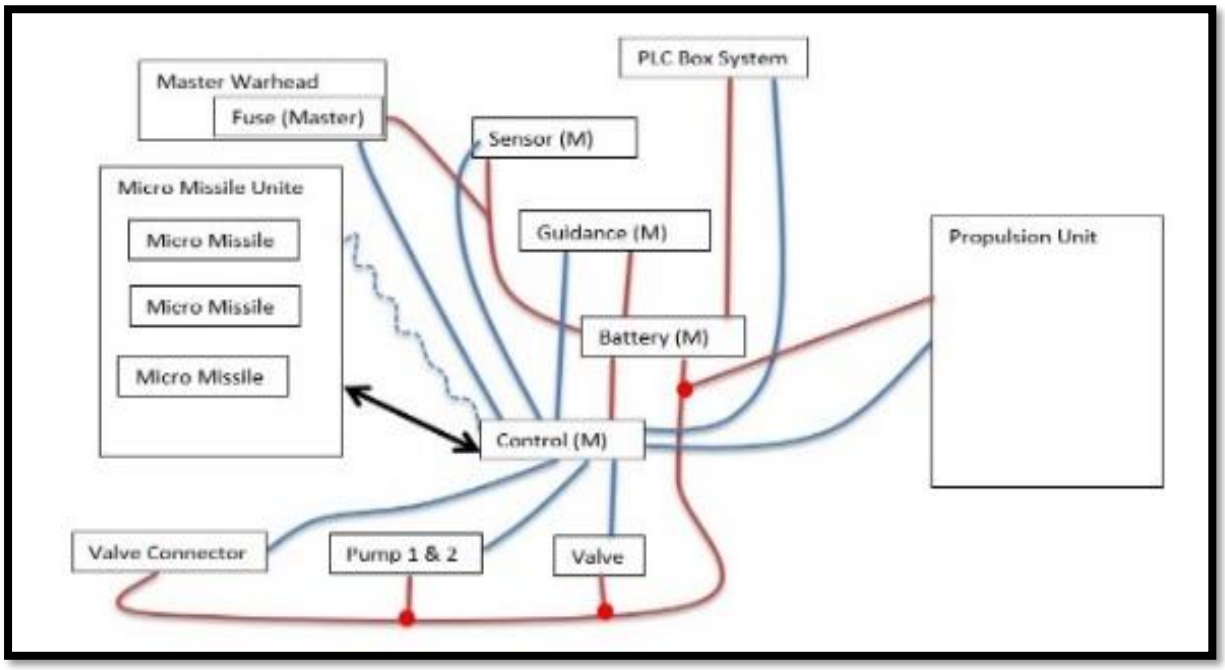
With special advantage of anti-fighter jets and anti-missile system in the military defense powers uses traditional information-based missile system have been not able to achieve the super attack ability. In the system of advanced missile defense, intelligent cluster can be used for multiple attacks. This intelligent system has multi-style intelligent for defense. The system uses a large number of target information acquired by multi-platform distributed sensors or seekers to construct a global precision strike intelligent missile penetration system which integrates "reconnaissance surveillance, situation

assessment, decision support, mission planning, command and control, information confrontation and firepower strike" and can fight under strong confrontation conditions. [12]

Utilizes regression analysis of this study, to illustrate equations for relate missile overall and subsection weights and geometries with including wings and fins. The variables which are considered to be the input for a new design in the conceptual or preliminary design phase. It is include packaging requirements. There are maximum length, diameter, and weight. These data collected from a variety



of military, industrial, and academic sources for analysis. We know that, the generic missile have three subsections: propulsion, guidance and control, and warhead. [10]



3 Methodology

Fig 1: Spiral Model of the Project

Analysis, Design & Development

Fig 2: Relational Diagram between Main missiles guidance and control system and MWMSS

Now, we have detected some problems from real some phenomena.

Proceedings DOI: 10.21467/proceedings.123
ISBN: 978-81-954993-5-9

Series: AIJR Proceedings
ISSN: 2582-3922

Problem 1: Have Not Any Chances

Problem 2: Never Attack Any More

Problem 3: Never Increase Attack Power

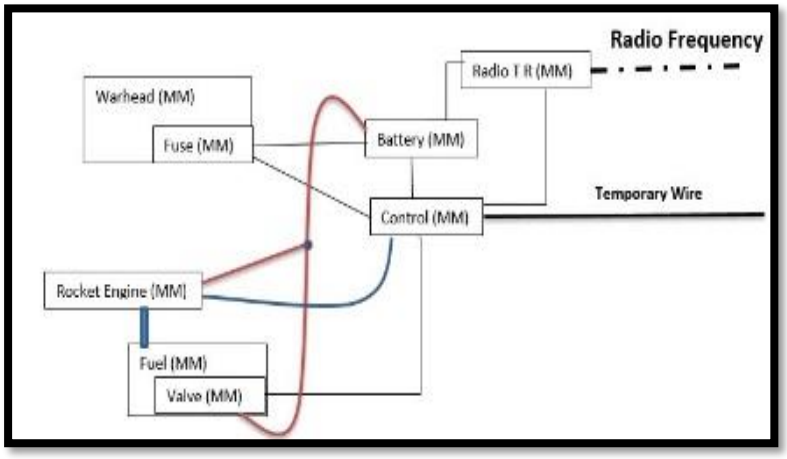
Problem 4: Have Not Any Extra Scopes

Problem 5: Have Not Multiple Activists

Problem 6: Never Defending With Multiple

Problem Description: We have seen in our observations that when an attacking missile does hit a target, another missile intercepts that attacking missile and if the interceptor becomes successful, the attacking missile will fall under problem no 1 and the attacking missile cannot attack again, so it exist problem no 2. Its attack rate will be reduced and there will be not additional opportunities for attack so it will fall under problem 3 and problem 4. Here seen that the attacking missile has no multiple activity or multiple opportunity to attack and this resistance is basically under problem 5 and problem 6. We have planned MWMSS to solve these problems of attacking missiles1. It is an intelligence system, built on some algorithms and physical designs. This system can be solved from the above problems.

Algorithm analysis: There are number of x (x≠>1) mini missiles set in the big missile's MWMSS block. These mini missiles are control by big missile's control unit. When Missile go to attack the target from launch pad. Missile defend against enemy missile. If in any phase, enemy missile come for



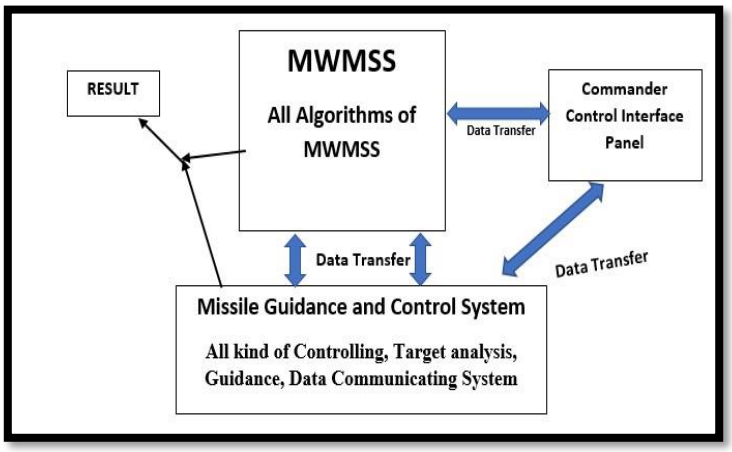
attack to the missile, it turn on active the all mini missiles set by big missile's control unite and launch required number of the mini missiles. The mini missiles which launched by big missile, it defending with enemy missile. Thus, mini missile engages or wins against with enemy missile by defending. Before launch's time mini missile, in active mode, control unit investigate the attack & defense situation. After this investigate, control unit take perfect action for launch and after this action it launches mini missile.

Figure 3: Block diagram of mini missile of MWMSS

Figure 4: Block Diagram of Missile system in MWMS

The MWMSS Missile defends against with enemy missile. When enemy missile coming for defend, Control (M) of the MWMSS missile takes 1st task. 1st task is finding require data of enemy missile. Then, takes 2nd task, it calculate require explosives for interception or resistance enemy missile. This task have 5 sub-task. The 1st sub-task – Check ability for interception enemy missile. If its yes then active next condition. 2nd sub-task – It is, select require number of mini missile for interception enemy missile. Now, 3rd sub-task – Calculate the fuel of select mini missile for interception enemy missile. If a mini missile have not require amount of fuel then wait for right time, else execute 4th sub-task. The 4th sub-task, Calculate the fuel of selected mini missile for interception enemy missile. If, the amount of missile's fuel is more than over for operation, it will execute the 5th sub-task else go to 3rd task. 5th sub-task – Start the pump forward, open the valve 2, valve (mm) and valve (M). The pump start forward for pumping fuel from Fuel (mm) to Propulsion' Fuel tank. The pump have been pumping fuel from fuel (mm) to propulsion's fuel tank until require amount of fuel for interception to enemy missile. If the amount of fuel pumped is equal to the amount of fuel required, then all the valves including the pump stop. Else, the pumping is continued. Continue 2nd task, also have done 3rd task. 2nd & 3rd task have continued at same time. The 3rd task- the big missile's controller (M) send a signal to selected mini missile's controller (mm) by connection wires. This signal working for active selected mini missile (mm). It does signal transfer synchronize with all condition of 2nd task. At last, it turn on wireless system between big missile and selected mini missile. After the tasks 2nd & 3rd, at 4th task, the connecting wire between controller (mm) and controller (M) are physically cut off. They only connecting by wireless medium from this task. The pipe of fuel (mm) and propulsion are physically disconnect in valve (mm). In a 5th task, the selected mini missile drop out from big missile. After the little time (much milliseconds) of drop out the mini missile, start the propulsion (rocket engine) of mini missile. All these tasks of MWMSS have made as algorithms.

There are few algorithms manage this MWMSS. There are 2 set algorithm in this system. 1st set is some modular algorithms. 2nd set is single algorithm which run those modular algorithms step by step.



Proceedings DOI: 10.21467/proceedings.123
ISBN: 978-81-954993-5-9

Series: AIJR Proceedings
ISSN: 2582-3922

4 Description & Result Analysis

Define Complexity: In this algorithm, the value of Sta cannot smaller than 1 and larger than 2, the value of Tsemi cannot smaller than 0 and larger than 20, the value of μ cannot smaller than 2 and larger than 5, Time Complexity: Time complexity of this algorithm is total time complexity of MWMSS all operating algorithms. So, time complexity of this algorithm is $O(Sta^2 + 10Tsemi^0 + 4Tsemi + 5\mu)$.

Space Complexity: Minimum space need for variables of this algorithm is 1543 bytes (1.50 kilobytes). This algorithm space complexity is $O(9sta + 4Tsemi + 64Tsemi^0 + 92\mu)$.

Result Analysis: We take a sample an MWMSS missile which have, some micro missiles. We have shown percentage of advantage ratio from MWMSS. We compare between an MWMSS missile and Non MWMSS missile. This compare between 1 MWMSS Missile (3 multi shells) vs 1 non MWMSS Missile event.

3 micro missiles vs 1 non MWMSS Missile event: If 2 non MWMSS missile does conflict then can happen 5 events. Now, the mathematical analysis,

1) Friction the 2 missile in the path. (No victory but not defeat)
2) 1st Missile can hit but 2nd missile cannot hit. (Victory 1st missile)
3) 1st Missile can hit and 2nd missile can hit. (Half victory 1st missile and Half defeat 1st missile)
4) 1st Missile cannot hit and 2nd missile can hit. (Defeat 1st missile)
5) 1st Missile cannot hit and 2nd missile cannot hit. (Half defeat 1st missile and not victory 1st missile).

Probability of 1st missile victory chance: total 5 events and a victory event. So, Probability of 1st missile's victory chance: $\frac{1}{5}$, Half victory chance: $\frac{1}{5}$, total victory chance: $\frac{2}{5}$, defeat chance: $\frac{1}{5}$, half defeat chance: $\frac{2}{5}$, total defeat chance: $\frac{3}{5}$. Percentage rate of probability of 1st missile's victory chance: 20%, half victory chance: 20%, total victory chance: 40%, defeat chance: 20%, half defeat chance: 40%, total defeat chance: 60%, Probability of 2 missiles conflict chance:$\frac{1}{5}$ and percentage rate of probability of 2 missiles conflict chance: 20%. In the last two value of above, probability of 2 missiles conflict chance and percentage rate of probability of 2 missiles conflict chance are very low. So, chance of victory is very low. Now, 1 MWMSS Missile (3 multi shells) vs 1 non MWMSS Missile does conflict then can happen 11 events. Advantage Ratio of MWMSS: In the mathematical analysis, probability of 1st missile's clean victory chance: $\frac{3}{11}$, victory chance: $\frac{4}{11}$, half victory chance: $\frac{4}{11}$, total victory chance: $\frac{8}{11}$, defeat chance: $\frac{1}{11}$, half defeat chance: $\frac{3}{11}$, total defeat chance: $\frac{4}{11}$.

Percentage rate of probability of 1st missile clean victory chance: 27%, victory chance: 36%, half victory chance: 36%, victory chance: 72%, defeat chance: 9%, half defeat chance: 27%, defeat chance: 36%, Probability of 2 missiles conflict chance: $\frac{4}{11}$ and percentage rate of probability of 2 missiles conflict chance: 36%. We see that, probability of 2 missiles conflict chance and percentage rate of probability of 2 missiles conflict chance are satisfying. So chance of victory is higher than 1 Non MWMSS vs 1 Non MWMSS. This difference is (36 – 20)% = 16%.

The difference of percentage rate of probability of 2 missiles conflict chance is 16%. It means a MWMSS (3 multi shells) missile is 16% higher then a Non MWMSS missile for conflict. And, The difference of total victory is = (72 – 40)% = 32%. The difference of total defeat is = (60 – 36)% = 24%. In the analysis, the difference of total victory is 32%. It means an MWMSS (3 multi shells) missile is 32% higher than a Non MWMSS missile for success. And, the difference of total defeat is 24%. It means a MWMSS (3 multi shells) missile is 24% less then a Non MWMSS missile for defeat.

5 Conclusion

This paper presented an advanced system of missile guidance and controlling. The Intercept system of anti-missiles is totally strong by this MWMSS. In the missile conflict situation, it is playing a game changer and a vital key role. In the issue of high security in national defense, MWMSS is the highly secure system for strategic missile defense. In this system, all algorithms ensure fault less and high activity. All algorithms take flawless action and constantly flow this MWMSS.

References

[1] Advances in Missile Guidance, Control and Estimation. S. N. Balakrishnan, A. Tsourdos, and B. A. White, 2012.

2] Aerodynamic–structural missile fin optimization. Nenad Vidanovi´c, Boško Rašuob, Gordana Kastratovi´c, Stevan Maksimovi´c, Dušan´Cur˘ci´c, Marija Samardži´c, 2017.

[3] Air and Missile Defense Systems Engineering. Warren J. Boord, John B. Hoffman, 2016.

[4] Command Guidance Missile Tracking Algorithms Evaluation Based on Visual Simulation. A. R El-gabri, A. N Ouda, Ahmed S. Ahmed, Yehia Z. Elhalwagy, Ahmed Khamis, Article in International Journal of Engineering and Technical Research. Vol 7, August 2018.

[5] Design and testing of a caseless solid-fuel integral-rocket ramjet engine for use in small tactical missiles. Fruge, Keith J, 1991.

[6] Design of a Solid Rocket Propulsion System, Adde Y. Alemayehu, Lulseged G. Solomon, July 2020.

[7] Fighter Combat Tactics and Maneuvering, Robert L. Shaw, 1987.

[8] Making Sense of Ballistic Missile Defense: An Assessment of Concepts and Systems for U.S. Boost-Phase Missile Defense in Comparison to Other Alternatives, Committee on an Assessment of Concepts and Systems for U.S. Boost-Phase Missile Defense in Comparison to Other Alternatives, Division on Engineering and Physical Sciences. 2012.

[9] Missile Guidance and Control Systems, George M. Siouris, 2003.

[10] Missile Total And Subsection Weight And Size Estimation Equations, John B. Nowell Jr. 1992.

[11] Radar Homing Guidance for Tactical Missiles, D.A. James, 1986.

[12] Research on Penetration Technology of Intelligent Cluster Missile System, Liu Zongang, Lu Jiaguo, Dong Zhen, 2019.

[13] Specific Design Features of Solid Propellant Rocket Motors for Shoulder-Launched Weapon Systems. Berko ZECEVIC, Jasmin TERZIC, Mario BASKARAD, Alan CATOVIC, Sabina SERDAREVIC-KADIC and Zijo PEKIC, 2010.

Proceedings DOI: 10.21467/proceedings.123
ISBN: 978-81-954993-5-9

Series: AIJR Proceedings
ISSN: 2582-3922