THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Conceptual Design of Virtual Missiles Using Recent Trends in Artificial Intelligence and Nanotechnology

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Abstract:
This technology incorporates the use of artificial intelligence (AI) and nanotechnology. It consists of a parent missile and the daughter missile. The features of parent missile is that it is the first one to be used against the targets. This will consist of cameras and sensors of nano size (referred as nano spies). As this missile explodes in the enemy land these nano materials will spread all over the area and starts sending the data about that area which will be received by the daughter missile. The feature of daughter missile is that once the data from the parent missile is received, this will see whether the conditions are favorable for it to strike the enemies. As the missile blasts off from the launch pad it will be constantly making decisions about the strategy of striking taking into consideration the data that is sent by the parent. The main feature is that it cannot be tracked by the radars of enemies. It will rotate on its own newly created axis in cases of any unpredicted attack from the enemies as informed by the parent missile unless all the conditions become favorable for it to fall to its final destination.

1. Introduction

1.1. Missiles

A missile is a self-propelled guided weapon system, as opposed to an unguided self-propelled munition, referred to as just a rocket. Missiles have four system components: targeting and/or guidance, flight system, engine, and warhead. Missiles come in types adapted for different purposes: surface-to-surface and air-to-surface missiles (ballistic, cruise, anti-ship, anti-tank, etc.), surface-to-air missiles (anti-aircraft andanti-ballistic), air-to-air missiles, and anti-satellite missiles. All known existing missiles are designed to be propelled during powered flight by chemical reactions inside a rocket engine, jet engine, or other type of engine. Non-self-propelled airborne explosive devices are generally referred to as shells and usually have a shorter range than missiles.

1.2. Early Developments

The first missiles to be used operationally were a series of missiles developed by Nazi Germany in World War II. Most famous of these are the V-1 flying bomb and V-2, both of which used a simple mechanical autopilot to keep the missile flying along a pre-chosen route. Less well known were a series of anti-shipping and anti-aircraft missiles, typically based on a simple radio control system directed by the operator. However, these early systems in World War II were only built in small numbers.

2. Missile Technology

Guided missiles have a number of different system components:

- Targeting and/or guidance
- Flight system
- Engine
- Warhead

2.1.1. Guidance Systems

Missiles may be targeted in a number of ways. The most common method is to use some form of radiation, such as infrared, lasers or radio waves, to guide the missile onto its target. This radiation may emanate from the target (such as the heat of an engine or the radio waves from an enemy radar), it may be provided by the missile itself (such as a radar) or it may be provided by a friendly third party (such as the radar of the launch vehicle/platform, or a laser designator operated by friendly infantry). The first two are often known as *fire-and-forget* as they need no further support or control from the launch vehicle/platform in order to function. Another method is to use a TV camera—using either visible light or infra-red—in order to

see the target. The picture may be used either by a human operator who steers the missile onto its target, or by a computer doing much the same job. One of the more bizarre guidance methods instead used a pigeon to steer the missile to its target.Many missiles use a combination of two or more of the above methods, to improve accuracy and the chances of a successful engagement.

2.1.2. Targeting Systems

Another method is to target the missile by knowing the location of the target, and using a guidance system such as INS, TERCOM or GPS. This guidance system guides the missile by knowing the missile's current position and the position of the target, and then calculating a course between them. This job can also be performed somewhat crudely by a human operator who can see the target and the missile, and guides it using either cable or radio based remote-control, or by an automatic system that can simultaneously track the target and the missile. Furthermore, some missiles use initial targeting, sending them to a target area, where they will switch to primary targeting, using either radar or IR targeting to acquire the target.

2.2. Flight System

Whether a guided missile uses a targeting system, a guidance system or both, it needs a flight system. The flight system uses the data from the targeting or guidance system to maneuver the missile in flight, allowing it to counter inaccuracies in the missile or to follow a moving target. There are two main systems: vectored thrust (for missiles that are powered throughout the guidance phase of their flight) and aerodynamic maneuvering (wings, fins, canards, etc.).

2.3. Engine

Missiles are powered by an engine, generally either a type of rocket or jet engine. Rockets are generally of the solid fuel type for ease of maintenance and fast deployment, although some larger ballistic missiles use liquid fuel rockets. Jet engines are generally used in cruise missiles, most commonly of the turbojet type, due to its relative simplicity and low frontal area. Turbofans and ramjets are the only other common forms of jet engine propulsion, although any type of engine could theoretically be used. Missiles often have multiple engine stages, particularly in those launched from the surface. These stages may all be of similar types or may include a mix of engine types - for example, surface-launched cruise missiles often have a rocket booster for launching and a jet engine for sustained flight.

Some missiles may have additional propulsion from another source at launch; for example the V1 was launched by a catapult and the MGM-51 was fired out of a tank gun (using a smaller charge than would be used for a shell).

2.4. Warhead

Missiles generally have one or more explosive warheads, although other weapon types may also be used. The warhead or warheads of a missile provides its primary destructive power (many missiles have extensive secondary destructive power due to the high kinetic energy of the weapon and unburnt fuel that may be on board). Warheads are most commonly of the high explosive type, often employing shaped charges to exploit the accuracy of a guided weapon to destroy hardened targets. Other warhead types include sub-munitions, incendiaries, nuclear weapons, chemical, biological or radiological weapons or kinetic energy penetrators. Warheadless missiles are often used for testing and training purposes.

3. Basic Roles

Missiles are generally categorized by their launch platform and intended target. In broadest terms, these will either be surface (ground or water) or air, and then sub-categorized by range and the exact target type (such as anti-tank or anti-ship). Many weapons are designed to be launched from both surface or the air, and a few are designed to attack either surface or air targets. Most weapons require some modification in order to be launched from the air or surface, such as adding boosters to the surface-launched version

3.1. Surface-To-Surface/Air-To-Surface

3.1.1. Ballistic

Ballistic missiles are largely used for land attack missions. Although normally associated with nuclear weapons, some conventionally armed ballistic missiles are in service, such as ATACMS. The V2 had demonstrated that a ballistic missile could deliver a warhead to a target city with no possibility of interception, and the introduction of nuclear weapons meant it could efficiently do damage when it arrived. The accuracy of these systems was fairly poor, but post-war development by most military forces improved the basic inertial platform concept to the point where it could be used as the guidance system on ICBMs flying thousands of kilometers. Today the ballistic missile represents the only strategic deterrent in most military forces, however some ballistic missiles are being adapted for conventional roles, such as the Russian Iskander or the Chinese DF-21D anti-ship ballistic missile. Ballistic missiles are primarily surface launched from mobile launchers, silos, ships or submarines, with air launch being theoretically possible with a weapon such as the cancelled Skybolt missile.

3.1.2. Cruise Missile

Cruise missiles are generally associated with land attack operations, but also have an important role as anti-shipping weapons. They are primarily launched from air, sea or submarine platforms in both roles, although land based launchers also exist. The BrahMos cruise missile which is a joint venture between India and Russia.

3.1.3. Anti-Ship

Anti-ship missiles were German missile development project that intended to stop any attempt at a cross-channel invasion. However the British were able to render their systems useless by jamming their radios, and missiles with wire guidance A number of anti-submarine missiles also exist; these generally use the missile in order to deliver another weapon system such as a torpedo or depth charge to the location of the submarine, at which point the other weapon will conduct the underwater phase of the mission.

3.1.4. Anti-Tank

By the end of WW II all forces had widely introduced unguided rockets using HEAT warheads as their major anti-tank weapon (see Panzerfaust, Bazooka). However these had a limited useful range of a 100 m or so, and the Germans were looking to extend this with the use of a missile using wire guidance, the X-7. After the war this became a major design class in the later 1950s, and by the 1960s had developed into practically the only non-tank anti-tank system in general use. During the 1973 Yom Kippur War between Israel and Egypt, the 9M14 Malyutka (aka "Sagger") man-portable anti-tank missile proved potent against Israeli tanks. While other guidance systems have been tried, the basic reliability of wire-guidance means this will remain the primary means of controlling anti-tank missile in the near future. Anti tank missiles may be launched from aircraft, vehicles or by ground troops in the case of smaller weapons.

3.2 Surface-To-Air

3.2.1 Anti-Aircraft

By 1944 US and British air forces were sending huge air fleets over occupied Europe, increasing the pressure on the Luftwaffe day and night fighter forces. The Germans were keen to get some sort of useful ground-based anti-aircraft system into operation. Several systems were under development, but none had reached operational status before the war's end. The US Navy also started missile research to deal with the Kamikaze threat. By 1950 systems based on this early research started to reach operational service, including the US Army's Nike Ajax, the Navy's "3T's" (Talos, Terrier, Tartar), and soon followed by the Soviet S-25 Berkut and S-75 Dvinaand French and British systems. Anti-aircraft weapons exist for virtually every possible launch platform, with surface-launched systems ranging from huge, self-propelled or ship-mounted launchers to man portable systems.

3.2.2 Anti-Ballistic

Like most missiles, the Arrow missile, S-300, S-400, Advanced Air Defence and MIM-104 Patriot are for defense against short-range missiles and carry explosive warheads.However, in the case of a large closing speed, a projectile without explosives is used, just a collision is sufficient to destroy the target. See Missile Defense Agency for the following systems being developed:

- Kinetic Energy Interceptor (KEI)
- Aegis Ballistic Missile Defense System (Aegis BMD) - a SM-3 missile with Lightweight Exo-Atmospheric Projectile (LEAP) Kinetic Warhead (KW)

3.3. Air-To-Air

German experience in World War II demonstrated that destroying a large aircraft was quite difficult, and they had invested considerable effort into air-to-air missile systems to do this. Their Me-262's jets often carried R4M rockets, and other types of "bomber destroyer" aircraft had unguided rockets as well. In the post-war period the R4M served as the pattern for a number of similar systems, used by almost all interceptor aircraft during the 1940s and '50s. Lacking guidance systems, such rockets had to be carefully aimed at relatively close range to successfully hit the target. The US Navy and U.S. Air Force began deploying guided missiles in the early 1950s, most famous being the US Navy's AIM-9 Sidewinder and USAF's AIM-4 Falcon. These systems have continued to advance, and modern air warfare consists almost entirely of missile firing. In the Falklands War, less powerful British Harriers were able to defeat faster Argentinean opponents using AIM-9G missiles provided by the United States as the conflict began. The latest heat-seeking designs can lock onto a target from various angles, not just from behind, where the heat signature from the engines is strongest. Other types rely on radar guidance (either on-board or "painted" by the launching aircraft). Air to Air missiles also have a wide range of sizes, ranging from helicopter launched self-defense weapons with a range of a few kilometers, to long range weapons designed for interceptor aircraft such as the Vympel R-37.

3.4. Anti-Satellite

In the 1950s and 1960s, Soviet designers started work on an anti-satellite weapon, called the "Istrebitel Sputnik", which meant literally, interceptor of satellites, or destroyer of satellites. After a lengthy development process of roughly 20 years, it was finally decided that testing of the Istrebitel Sputnik be canceled. This was when the U.S. started testing their own systems. The Brilliant Pebbles defense system proposed during the 1980s would have used kinetic energy collisions without explosives. Anti satellite weapons may be launched either by an aircraft or a surface platform, depending on the design. To date, only a few known tests have occurred.

4. Problem Faced By The Existing Technology

Even missile technology has developed rapidly, the main problem faced is the unexpected attack by the enemies. In cases of such attacks, the nation to which the missile belongs will be pulled to a situation of heavy technological and economical loss. It will be very difficult for the nation to overcome such a ridiculous situation. Hence we are here with a new technology.

5. Our Proposed Idea:Virtual Missile Technology

This technology incorporates the use of artificial intelligence (AI) and nanotechnology. It consists of a parent missile and the daughter missile. The feature of parent missile is that it is the first one to be used against the targets. This will consist of cameras and sensors of nano size (referred as nano spies). As this missile explodes in the enemy land these nano materials will spread all over the area and starts sending the data about that area which will be received by the daughter missile. Feature of daughter missile is that, once the data from the parent missile is received, this will see whether the conditions are favorable for it to strike the enemies. As the missile blasts off from the launch pad it will be constantly making decisions about the strategy of striking taking into consideration the data that is sent by the parent. The main feature is that it cannot be tracked by the radars of enemies. It will rotate on its own newly created axis in cases of any unpredicted attack from the enemies as informed by the parent missile unless all the conditions become favorable for it to fall to its final destination.

5.1. Artificial Intelligence

Artificial intelligence (AI) is technology and a branch of computer science that studies and develops intelligent machines and software. The general problem of simulating (or creating) intelligence has been broken down into a number of specific sub-problems such as **deduction, reasoning, problem solving.** Human beings solve most of their problems using fast, intuitive judgments rather than the conscious, step-by-step deduction that early AI research was able to model. AI has made some progress at imitating this kind of "sub-symbolic" problem solving: embodied agent approaches emphasize the importance of sensor motor skills to higher reasoning; neural net research attempts to simulate the structures inside the brain that give rise to this skill; statistical approaches to AI mimic the probabilistic nature of the human ability to guess.Knowledge representationand knowledge engineering are central to AI research. Many of the problems machines are expected to solve will require extensive knowledge about the world. Among the things that AI needs to represent are: objects, properties, categories and relations between objects; situations, events, states and time; causes and effects; knowledge about knowledge (what we know about what other people know); and many other, less well researched domains. A representation of "what exists" is an ontology: the set of objects, relations, concepts and so on that the machine knows about. The most general are called upper ontologies, which attempt to provide a foundation for all other knowledge.

5.2. Nanotechnology

Nanotechnology is the manipulation of matter on an atomic and molecular scale. The earliest, widespread description of nanotechnology referred to the particular technological goal of precisely manipulating atoms and molecules for fabrication of macro scale products, also now referred to as molecular nanotechnology. A more generalized description of nanotechnology was subsequently established by the National Nanotechnology Initiative, which defines nanotechnology as the manipulation of matter with at least one dimension sized from 1 to 100 nanometers. This definition reflects the fact that quantum mechanical effects are important at this quantum-realm. Molecular nanotechnology is the proposed approach which involves manipulating single molecules in finely controlled, deterministic ways.

6. Conclusion

Thus as per our proposed idea the main problem faced by missile launching can be solved. Today the development in artificial intelligence and nanotechnology are really surprising. So our proposed idea can come into existence much easily which will be definitely mark a great improvement in missile technology.

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