Artificial Intelligence

The **history of artificial intelligence** began in **antiquity**, with myths, stories and rumors of artificial beings endowed with intelligence or consciousness by master craftsmen; as Pamela McCorduck writes, AI began with "an ancient wish to forge the gods.

Artificial intelligence is the ability of a machine to respond intelligently to its environment and involves the development of computer systems which model human behaviour. In saying this we are saying that the robot is going to be able to make reasoned choices in a similar way to humans.

- The ability to reason
- The ability to show emotion
- The ability to empathise
- The ability to predict based on assumptions and previous experience
- The ability to make decisions

- The ability to be able to communicate in a human like way

If we remove one of this we do not immediately lose intelligence but it does affect our ability to understand and communicate with other people. Some points may at first glance seem strange. How does the ability to empathise, or in other words to understand how another person feels in a particular circumstance affect our intelligence. If a person cannot understand how a particular action will make people feel and because of this lack the ability to predict how a person or a group of people will respond to a particular circumstance it becomes very difficult for that person to fully integrate into society.

If machines are going to help make decisions for us then they need to reason in some kind of empathetic way.

There are many things that make us intelligent beings. These are some points that are repeated among many different writers. Humour is one example that researchers find hard to program robots and AI to recognise. many researchers now see this as an important area to help robots fot into society and not just be a nuisance. Dr Lawrence Mazlack, director of the applied artificial intelligence laboratory at Cincinnati University, and colleagues have built a computer program - or 'bot' - that is able to get a specific "pun-style" joke.
Classes of intelligent agents

Simple reflex agent

Model-based reflex agent
Model-based, goal-based agent

Russell & Norvig (2003) group agents into five classes based on their degree of perceived intelligence and capability:

1. simple reflex agents
2. model-based reflex agents
3. goal-based agents
4. utility-based agents
5. learning agents

Simple reflex agents

Simple reflex agents act only on the basis of the current percept, ignoring the rest of the percept history. The agent function is based on the condition-action rule: if condition then action.

This agent function only succeeds when the environment is fully observable. Some reflex agents can also contain information on their current state which allows them to disregard conditions whose actuators are already triggered.

Infinite loops are often unavoidable for simple reflex agents operating in partially observable environments. Note: If the agent can randomize its actions, it may be possible to escape from infinite loops.

Model-based reflex agents

A model-based agent can handle a partially observable environment. Its current state is stored inside the agent maintaining some kind of structure which describes the part of the world which cannot be seen. This knowledge about "how the world works" is called a model of the world, hence the name "model-based agent".

A model-based reflex agent should maintain some sort of internal model that depends on the percept history and thereby reflects at least some of the unobserved aspects of the current state. It then chooses an action in the same way as the reflex agent.

Goal-based agents

Goal-based agents further expand on the capabilities of the model-based agents, by using "goal" information. Goal information describes situations that are desirable. This allows the agent a way to choose among multiple possibilities, selecting the one which reaches a goal state. Search and planning are the subfields of artificial intelligence devoted to finding action sequences that achieve the agent's goals.

In some instances the goal-based agent appears to be less efficient; it is more flexible because the knowledge that supports its decisions is represented explicitly and can be modified.

Utility-based agents

Goal-based agents only distinguish between goal states and non-goal states. It is possible to define a measure of how desirable a particular state is. This measure can be obtained through the use of a utility function which maps a state to a measure of the utility of the state. A more general performance measure should allow a comparison of different world states according to exactly how happy they would make the agent. The term utility, can be used to describe how "happy" the agent is.
A rational utility-based agent chooses the action that maximizes the expected utility of the action outcomes - that is, the agent expects to derive, on average, given the probabilities and utilities of each outcome. A utility-based agent has to model and keep track of its environment, tasks that have involved a great deal of research on perception, representation, reasoning, and learning.

Learning agents

Learning has an advantage that it allows the agents to initially operate in unknown environments and to become more competent than its initial knowledge alone might allow. The most important distinction is between the "learning element", which is responsible for making improvements, and the "performance element", which is responsible for selecting external actions.

The learning element uses feedback from the "critic" on how the agent is doing and determines how the performance element should be modified to do better in the future. The performance element is what we have previously considered to be the entire agent: it takes in percepts and decides on actions.

The last component of the learning agent is the "problem generator". It is responsible for suggesting actions that will lead to new and informative experiences.

Expert system

The first expert systems appeared in the late sixties. Today, they exist in many forms, from medical diagnosis to investment analysis and from counseling to production control. Due to the advances of the last decade, today's expert systems users can choose from dozens of commercial software packages. At present, we accept as routine such expert systems as weather forecasting, online mapping and driving directions, diagnostic systems for automotive repair shops, and so on.

Many large corporations use expert systems in their business. The list of the companies using expert systems technology is long and varied: NASA, HP, Lockheed, Boeing, DaimlerChrysler AG, various power, gas and oil stations, etc.

Expert systems tend to be more effective than other computer based applications, because they:

- may combine the knowledge of many experts in a specific field,
- can store an unlimited amount of information, and works much faster, than a human,
are available 24 hours a day, and can be used at a distance over a network,
are able to explain their information requests and suggestions,
can process client's uncertain responses and, by combining several pieces of uncertain information, may still be able to make strong recommendations,
can accumulate the knowledge of high level employees for any company, which is especially useful when the company needs to fire them due to worsened market conditions.

Categories of Expert Systems

Many applications are not covered here, and some manufacturers and resellers belong in multiple categories. Due to the space limitations, manufacturers are included in only one category.

Interpretative ES

Expert systems in this category interpret information from sensors to describe a situation. For example, this might be the interpretation of process measuring information in a chemical plant. Interpretative ES deals with real data.
Therefore, these ES must not only retrieve, but also analyze, filter and restore missed data, as well as mine data, transform data to another format, and so on.

Interpretative expert systems can handle various types of data, such as data for the recognition of voice, visual, smell, touch or gestures. Examples within this category of ES include:

- Netrics Data Quality Software, from Netrics, Inc., which enables cleansing of data for mission-critical and business-critical operations. The Netrics line of products may deliver a near-perfect accuracy of data, for “dirty” or error-prone data. Netrics develops tools which allow matching imperfect data in real-time, despite inconsistencies, incompleteness, variations and errors.
- Nuggets and eNuggets toolkits, from Data Mining Technologies, Inc., are desktop applications, which build models to uncover hidden facts and relationships for industries such as healthcare, biotechnology, and telecommunications. These tools can predict new data and trends, and reveal which variables make decisions with the most impact.

**ES for Abnormal Condition Recognition**

Expert systems perform abnormal condition recognition (ACR) or, in other words, diagnosis of the condition of an object or process using a description of the situation, knowledge of the architecture (structure and functions) of the subject, and other methods, to establish the probable causes of incorrect operations.

These expert systems oftentimes serve as consultants, who not only make the diagnosis, but also help with debugging. ACR can assess the technical condition of a complex industrial system, or the health condition of a human. The technical diagnostic type of expert system is combining artificial intelligence techniques with equipment fault diagnosis techniques. It uses special knowledge and a method provided by experts which simulates the inference process of the experts, to solve various complicated and important problems.

MatheMedics Inc. has developed medical diagnostic programs for the back, chest, abdomen, and other sign/symptom domains, and has considerable experience with the creation of efficient medical expert and decision support systems.

Gensym Corporation has developed the G2 platform and new products, NeurOn-Line, Optegrity, and e-SCOR, which enable real-time expert system applications.

Transformer Oil Analyst (TOA), developed by Delta-X Research, warns the staff of any suspicious symptoms or trends. Whenever an equipment or insulating fluid problem is suspected, TOA enables the user to quickly review both the historic (previous) and current status.
Shop Automated System of Technical Diagnostics (SASTD) was created by Intellectual Systems, Inc. in Russia, while the author was founder and President of this company. SASTD is real-time hybrid ES for a pipe line gas compressor station.

**ES for Prediction and Forecast**

The prediction and forecast category of ES enables the forecasting of possible outcomes of observable situations. Examples may include the prediction of crop damage from harmful insects, estimation of the demand for oil in the global market place, or prediction of the next armed conflict. Also included in this category are weather forecasting, scoring and predictive modeling, risk management and other financial forecasting, to name a few. Examples of products in this category are:

- NeuralWorks Predict, developed by [Neuralware Inc.](https://www.neuralware.com), is an integrated tool for rapidly creating and deploying prediction and classification applications. This system is based on neural network technology, combined with genetic algorithms, statistics, and fuzzy logic, to automatically find optimal or near-optimal solutions for a wide range of problems.
- NeuroXL Predictor, developed by [NeuroXL Inc.](https://www.neuroxl.com), is a neural network forecasting tool that quickly and accurately solves forecasting and estimation problems for a wide variety of tasks, including stock price prediction, sales forecasting, and sports score prediction.
- Forecasting Software developed by the [Vanguard Corporation](https://www.vanguardcorp.com), combines different decision support methods to find the best forecast for the needs of an individual or entire organization.

**ES for Design and Management Solutions**

After considering a great number of variable parameters for solving innovation tasks, ES can assist in the optimization of design, and find the best management decisions. Usually such expert systems are important parts of CAD/CAE/SIM systems. In this category are such products as the Goldfire complex of tools, developed by [Invention Machine](https://www.inventionmachine.com). These Goldfire tools provide:

- Innovation Trend Analysis
- Research
- Process Analysis
- Root Cause Analysis

**ES for Control and Monitoring**
These categories exist as the portion of control systems that help to monitor operations, and to control certain functions of the machinery in various types of enterprises. Many corporations that have developed Supervisory Control and Data Acquisition Systems (SCADA) have used expert systems for different control levels of industrial plants. For example, Emerson Process Management, Inc. is developing the following products:

- The DeltaV Advanced Control Suite, which includes simulation and optimization subsystems
- The Ovation expert control system, which gives users higher levels of plant availability, reliability and environmental compliance
- WDPF control systems, which integrate plant process control, local and wide area SCADA systems, PLC networks, maintenance management, and so on.

The British company, Knowledge Process Solutions Inc., has developed an intelligent plant technology (IntelliPlant) that includes model-based multivariate control and optimization subsystems for minimizing costs. The control and optimization technology includes the ability to develop statistical models of equipment behavior, based on data mining technology. These technologies have a low cost with fast implementation speed.

**ES for Analysis and Reporting**

There are several popular applications on the American market:

- The Analysis, DSS and Reporting Suites, developed by MicroStrategy Inc., are Business Intelligence applications for integrating, reporting, analysis, and information delivery abilities in one platform
- PowerCenter and Informatica Platform, from Informatica Corporation, is designed for mass deployment and adoption of business analytics

The Israeli company, Expert Solutions International, produces the expert system, Logist, which enables organizations to rapidly create robust applications, well-integrated with their business activities, while achieving the following goals:

- Preserve the organization’s hidden knowledge assets, in the form of business rules
- Create dynamic applications that can adapt to market speed, thereby sharpening the organization’s competitive advantage
- Simplify knowledge sharing within the organization
- Empower the business with knowledge
- Lower implementation and assimilation costs

**ES for Manufacturing**
Manufacturing is one of most robust areas of expert systems and AI-related activities. It is very difficult to find statistical data about the implementation of these systems in the various industries of developed countries of the world. However, it is possible to make some extrapolation. According to a 1994 study involving ninety-eight Fortune 500 industrial companies, expert systems were utilized in manufacturing by 52% of the companies, where ES was perceived to be very useful in process planning, product design, layout, facility design and maintenance. Undoubtedly, there are now more than 52% of solid companies using expert systems. Manufacturing ES is a part of Computer-Integrated Manufacturing (CIM) or Intelligent Manufacturing Systems (IMS). Manufacturing ES may be applied to almost any manufacturing area, including planning, design and system configuration, process control, quality control, and so on.

One popular product on the market is G2 e-SCOR, developed by Gensym Corporation. The G2 e-SCOR product enables the simulation of various configurations, tests the robustness of the supply chain, and identifies the required service levels. This product can help identify the weak links and areas for improvement in the supply chain, thereby saving time and money.

**ES for Marketing and Trade Management**

A key use of artificial intelligence in marketing and trade management ES is to determine marketing potential and business opportunities. The Ward Systems Group, Inc. puts out AI Trilogy, a new package of business and scientific software. AI Trilogy contains the NeuroShell Predictor, NeuroShell Classifier, and GeneHunter software together in one package. Data Mining Technologies Inc. provides several types of modeling services for developing marketing and trade management ES, including:

- Prospect segmentation modeling
- Customer segmentation modeling
- Customer cloning
- Prospecting for new customers
- Finding high-value new customers
- Maximizing return from loyalty programs

MarketResearch.com is the world’s largest and continuously-updated collection of market research, with more than 200,000 reports from over 650 leading global publishers. Much of this was accomplished with the help of ES.

**ES for E-Learning**
E-Learning Systems (ELS) is based on special tools, and supplies individual or group education and training for different disciplines. These learning tools and services make the learning process faster and more adaptive to the challenges of the business world. ELS can include Learning Management Systems and Course Management Systems. Following are some developers and providers of e-Learning systems:

- **GeoLearning, Inc.** is a leading developer of e-learning delivery platforms and web-based training solutions for organizations around the world, including Fortune 1000 companies, government agencies, and so on.
- **CompanyCollege.com** is the e-learning solution from Business Training Library Inc., the provider of affordable training solutions for small companies; this company offers easy to use, completely customizable online learning to the Business Services, Financial Services, and Healthcare fields, among others.

### Applications

### Criteria

#### Acting humanly: The Turing test

Turing (1950) *Computing machinery and intelligence*:

- *Can machines think?*
- *Can machines behave intelligently?*

Operational test for intelligent behavior: the Imitation Game

- **AI SYSTEM**
- **HUMAN**
- **INTERROGATOR**

- Predicted that by 2000, a machine might have a 30% chance of fooling a lay person for 5 minutes
- Anticipated all major arguments against AI in following 50 years
- Suggested major components of AI: knowledge, reasoning, language
understanding, learning
Problem: Turing test is not reproducible, constructive, or amenable to mathematical analysis

Chapter 1 4

**Thinking humanly: Cognitive Science**
1960s \cognitive revolution": information-processing psychology replaced prevailing orthodoxy of behaviorism
Requires scienti_c theories of internal activities of the brain
{} What level of abstraction? \Knowledge" or \circuits"?
{} How to validate? Requires
1) Predicting and testing behavior of human subjects (top-down)
or 2) Direct identi_cation from neurological data (bottom-up)
Both approaches (roughly, Cognitive Science and Cognitive Neuroscience) are now distinct from AI
Both share with AI the following characteristic:
the available theories do not explain (or engender) anything resembling human-level general intelligence
Hence, all three _elds share one principal direction!

Chapter 1 5

**Thinking rationally: Laws of Thought**
Normative (or prescriptive) rather than descriptive
Aristotle: what are correct arguments/thought processes?
Several Greek schools developed various forms of logic:
notation and rules of derivation for thoughts;
may or may not have proceeded to the idea of mechanization
Direct line through mathematics and philosophy to modern AI
Problems:
1) Not all intelligent behavior is mediated by logical deliberation
2) What is the purpose of thinking? What thoughts should I have out of all the thoughts (logical or otherwise) that I could have?

Chapter 1 6

**Acting rationally**
Rational behavior: doing the right thing
The right thing: that which is expected to maximize goal achievement, given the available information
Doesn't necessarily involve thinking\ie, blinking reex\but thinking should be in the service of rational action
Aristotle (Nicomachean Ethics):
Every art and every inquiry, and similarly every action and pursuit, is thought to aim at some good
Applications

Military

**AI Uses**

*AI Goes to War*

As with many other fields of scientific study, the military has picked up on the use of Artificial Intelligence. The possibilities of military use of AI are boundless, exciting, intimidating, and frightening. While today's military robots are used mainly to find roadside bombs, search caves, and act as armed sentries, they have the potential to do so much more.

Not all military uses of AI directly relate to the battlefield however; it can use Artificial Intelligence for more passive purposes as well. For example, the military has developed a computer game that uses AI to teach new recruits how to speak Arabic. The program requires soldiers to complete game missions during which they must be able to understand and speak the language. This system gives the soldiers a more realistic, easy, and effective way to learn the new tongue. This particular game works by using speech recognition technology that evaluates the soldier's words and detects common errors. It can then create a model of the soldier, keeping track of what he's learned and what he hasn't in order to provide individualized feedback for the soldier's specific problems. Those who are working on this project believe that it will change the face of all language learning and similar programs will become mainstream sometime in the near future.

The military is also trying to create automated vehicles — the ultimate autopilot. Machines already have the ability to see the world around them and read a map, theoretically well enough to be able to drive from point to point without human assistance. However, when the Pentagon first sponsored a competition for prototype-automated vehicles in the Mojave Desert in 2004 to test their resilience against difficult terrain, none of the fifteen entries crossed the finish line. The following year, a car built by students at Stanford University completed the 131 mile course in six hours and 53 minutes. The car completed the race without any human input, using only onboard computers and sensors to navigate terrain meant to mimic
combat conditions in Iraq and Afghanistan. Though this proved that great strides had been made in one year alone, even more are needed before the technology can be marketed and put to real use.

According to the Pentagon, actual robotic soldiers powered by Artificial Intelligence will be a major fighting force in the American army, probably within the next decade. The first robot soldiers will actually be remote-controlled vehicles. The military has poured tens of billions of dollars into this project already. Congress wants to see this happen, and they ordered that a third of all military vehicles and deep-strike aircraft be automated by 2010.

As the machines begin to think, see, and react more like humans, the level of their autonomy and our level of trust in them will grow as well. However, it is predicted that a true soldier-simulating robot will not come about for another 30 years. These robots need to be able to determine friend from foe and enemy from bystander, and teaching them to do so will require a tremendous amount of research and work. The government has assured us however that these robotic soldiers will not be put into the field and allowed to make such decisions until they are ready to do so.

Another current infantry prototype knows how to recognize an enemy when it is under fire. When this happens, it can react to enemy fire on its own or follow orders given to it from a remote observer. Although it's programmed to work autonomously, in its present state, it still requires some set of outside monitoring controls in order for it to work. Its designers plan to have it usable for infantry missions by 2015.

Another one of their prototypes nearly realizes the anthropomorphic goal imagined by Isaac Asimov in his *I, Robot* book. This prototype is a machine about four feet high with a Cyclops eye and a gun for a right arm. It is programmed to perform basic hunting and killing tasks. It can actually find valid targets on its own and can shoot at them with remarkable accuracy.

The list of benefits of using machines to achieve military goals is long and significant. The immediate and most evident boon of such technology is the elimination of human risk: machines, not humans, would be lost in battle. In addition, specialized robots can be designed to accomplish specific tasks more effectively than humans can, increasing the military's overall effectiveness. They are also more cost-effective. Robots will always be able to do what they were designed to do and can be recycled when they are obsolete. A human soldier costs on average $4 million dollars over his lifetime, and the U.S. Pentagon cannot obtain the money to pay all of them. Robots could cost a tenth of that amount or less.

Although the ultimate goal of the robot soldier is to completely eliminate human risk, even the experts say that war will always be a human endeavor involving human loss of life, no matter how much the AI warrior is developed. New ethical questions will arise once we have the ability to invade countries without risk of bloodshed on the part of the invader. And even though these robotic developments will soon be on our doorstep, it’s a little frightening to see that the only ones who are addressing the issue of use and or misuse of such technology are the scientists and the authors of science-fiction.
AI techniques at Air Force Research Lab to extend target identification

DAYTON, Ohio — One of the ways artificial intelligence can extend military capabilities is in interpreting "non-literal sensors," says Dale Nelson, chief of the target recognition branch in the Sensors Directorate of the Air force Research Laboratory at Wright-Patterson Air Force Base in Dayton, Ohio.

"People don't see in X-ray or listen to sonar signals," he says, and that is a role he envisions for AI in target recognition. Synthetic aperture radar, or SAR, is not like anything on the human body. "SAR looks like a photo, but it's not," Nelson notes.

Yet the medical community uses similar AI techniques for X-ray interpretation, and the military can put this technology to work for its unique missions, such as distinguishing a tank from a school bus.

Nelson, who quips that AI is "what you haven't done yet," is investigating control programs based on what are known as genetic algorithms to enable aircraft to get smarter after each battle. Like the human genes for which they are named, genetic algorithms permit knowledge to be passed down from one generation of weapon system to another.

The effort also involves data mining. "The Air Force, like companies, has vast databases and we need to get useful patterns," Nelson says. The approach is to organize the data into a table in which each column is a different attribute of the target and each row is the target.

By using AI techniques to reduce the number of columns, the idea is to find the minimum number of features to identify all targets. He estimates this data reduction can cut the 128 candidate attributes to about 25 important attributes for target recognition.

"We've picked the low hanging fruit, and now we need automatic learning," Nelson notes. "The organism that doesn't learn is dead." — J.R.

Games

Elements of artificial intelligence used in computer games have come a long way. In the beginning, the developed systems were based on sets of rules written directly in the code of the game or on the behaviour scripts interpreted by the code, with the whole thing based most commonly on the appropriate selection of importance of the random factor in the process of choosing the appropriate behaviour. That time witnessed the birth of such memorable games as the immortal River-Raid, Donkey-Kong, Boulder-Dash, and many other objects of fascination for users of eight-bit machines, back in the 1970s.

Another step in the development process was introducing simple computer science methods, such as the still popular and frequently used Finite State Machine method, into describing the
behaviour of the computer-controlled enemies. However, as the demands of the players grew day by day, games grew more and more complicated, thanks to the use of more and more advanced computing algorithms. The dawn of the era of RTS-type games (Real Time Strategy) has caused a significant shift of interest (in terms of frequency of use) to algorithms which determine the optimal path between two specified points on a map.

Fast technical progress and rapid increase of processing power of home computers were also a catalyst for the development of applications using artificial intelligence in computer games. The first games and artificial intelligence algorithms had to settle for limited capabilities of machines available at that time, with the processor frequencies no higher than 2 MHz. The first PCs brought in new possibilities and new applications. After PCs with 386/486 processors became the standard for a home computer, programmers were given new possibilities; that led to the start of a race between game development companies. For a long time, the foremost indicator of a computer game's quality was the quality of three-dimensional graphics it featured; however, a realisation soon came that nice graphics, sound, and character animation is not everything. Recently, one of the most important elements of computer games has been identified as artificial intelligence as the primary factor behind the so-called playability of present-day video games.

The process of production of computer games has undergone significant changes as well. Even though programming the artificial intelligence of a game used to be treated slightly unfairly, and its implementation tended to be pushed to near the end of the production of the game's engine, at present, planning the modules of artificial intelligence and their co-operation with other components of the game is one of the most important elements of the planning process.

More and more frequently, at least one of the members of a programming team is designated to, full-time and ever since the beginning of the project, handle designing and programming the modules of artificial intelligence.

At present, when in most homes, one can find PC-class computers with Pentium IV processors with frequencies in the range of 3 to 4 GHz, it is being considered to let computer games make use of the most advanced and sophisticated methods of artificial intelligence: neural networks, genetic algorithms, and fuzzy logic. In the age of Internet and network games, artificial intelligence systems in games have been given new tasks: a computer player should, in its behaviour and strategies of playing, be indistinguishable from a real player on the other side of an Internet connection.

**Combat Oriented AI**

Probably the most often implemented form of AI, combat oriented AI can be seen in almost every shooter since the mid nineties. Designers of First Person Shooters depend on combat AI to make their games playable, let alone interesting. The evolution of combat AI was slow for many years. Most AI opponents were relegated to shambling forward, often right into the player's gunfire. It wasn't until Valve released Half-Life that combat AI took a major turn for the better. The infamous Marines showed a level of AI unseen in previous games. With different reactions for getting shot, spotting grenades and even a realistic awareness of the player, AI comrades and enemies, Half-Life quickly asserted itself as having the best AI in any game. After Half-Life,
more and more games started to focus on the AI aspect of game design instead of just graphics. Today, combat AI's can be seen ducking around corners or behind boxes, tossing the player's grenades back, and even standing in for real players in multiplayer games. Still, combat AI's have plenty of room for improvement before they even get close to replacing human opponents. Even though combat AI's can dodge incoming fire and shoot like a pro, there are four major things that human combatants offer over AI: knowledge of their environment, efficient use of teamwork, the ability to "hunt", and survival instincts.

**The Understanding & Exploitation of Terrain**

Play any online game with solid maps and veteran players and you will see a plethora of different interactions with the game environment. Smart players inevitably find places to hide behind for cover, alternate routes to an important destination, even great spots for ambushes. I have never seen a Bot (Combat AI designed for multiplayer games) in any game utilize any of the above-mentioned functions without being explicitly trained to do so. The ability to dynamically interact with terrain will be a very important feature in future games.

**Efficient Use of Teamwork**

In multiplayer games, it is custom for veteran or experienced players to routinely play in well-organized teams, called "Clans." For example, I'll use Counter-Strike or CS for short. CS is a modification of the above-mentioned Half-Life wherein players try to meet objectives within a time limit, often while being pursued by the enemy team. Teamwork is very important in CS, and as such CS has become a favorite of many Clans. The reason I use the example of Clans is that, although teamwork can be seen among non-Clan players, it tends to be more sporadic and self-serving at best. If Combat AI could be made to use teams, it would dramatically improve both their realism and efficiency, with certain variants of Combat AI becoming as revered as the Clans. It might, however, prove to be a complicated task to teach computers to work in teams, as even humans seem to find it difficult much of the time.

**The Ability to Hunt**

Since the beginning of the First Person Shooter with id's Wolfenstein, Combat AI has stood in a perpetual state of Guard Mode. The player invariably steps onto the Combat AI's turf. Whether the player tries to sneak past them or go for a straight shoot 'em up, the Combat AI must decide how to react to the player in a very short time. This translates to too many scenes of déjà vu in almost every game. The important point about "Hunting," where it is up to the Combat AI to find you, is a very complex function, and one that would require both detailed sensors built into the Combat AI and the player's ability to realistically affect the environment, like footprints, etc.

**The Survival Instinct**

When I refer to survival instincts, I mean those actions intended solely to protect oneself, even when the possibility of getting "hurt" is nonexistent. For instance, players online can be observed to hide behind obstacles when they reload, or to run short distances at a time, or even to just stay out of an area known to be swarming with hostiles. Developers have started to code some
survival motions into Combat AI's recently, such as hiding behind boxes when getting shot at, but there is still much room for improvement. The survival instinct, which at times might be referred to as cowardice, is probably the feature that makes a Combat AI appear the most human.

These four characteristics of a great Combat AI, while important individually, make the game experience most believable when used together. In CS, for example, players stand on each other's backs to reach otherwise inaccessible points in the terrain. Similarly, if the Combat AI only hunted or hid, the experience would become dull. Ultimately, it remains to be seen whether any one of these features is fully achievable, let alone all four.

The Hummingbird's bird-shaped body is removable but it gives the bot an uncanny resemblance to a real [link to hummingbird]. The vehicle can hover and maneuver just like the bird.

The [link to ornithopter] can fly into buildings under the control of an operator flying the spybot with the help of a feed from its tiny [link to video camera]. The prototype is capable of flying at speeds of up to 18 km/h (11 mph) and weighs 19 grams, which is about the same as an AA battery.

[AeroVironment video of flight tests of its Nano Hummingbird flapping-wing nano air vehicle, developed for DARPA.]

Manager of the project, Matt Keennon, said it had been a challenge to design and build the spybot because it “pushes the limitations of aerodynamics.” The specifications given to the firm by the Pentagon included being able to hover in an 8 km/h wind gust and being able to fly in and out of buildings via a normal door.
The spybot was developed for the US military's research arm, the Defense Advanced Research Projects Agency (DARPA). The hummingbird appearance is intended to disguise the bot, although it would look decidedly out of place and would attract attention in most places in the world since hummingbirds are not found outside of the Americas.

DARPA's head of the Nano Air Vehicles (NAV) program, Dr Todd Hylton, said the successful flight tests pave the way for new vehicles that resemble small birds and match their agility. The new drone is a departure from existing NAVs, which in the past have always resembled helicopters or planes.

The US military has funded the project, giving AeroVironment around $4 million since 2006.
Chatbots are programs designed to simulate conversation with an actual human, usually via text chat. Most of these programs wouldn’t fool even the most gullible people among us into thinking they possess any kind of intelligence, but a souped-up version of Cleverbot recently passed a Turing test at a tech conference in India.

Cleverbot is a bit different than most chatbots – instead of choosing from any number of canned responses, the program “learns” based on responses it receives from other conversations, and then integrates them into its repertoire. It then uses an algorithm to select an “appropriate” response. This can pay off with realistic responses or can give you truly bizarre answers, as seen below:

Keep trying, Cleverbot!

Radio station appoints AI “virtual assistant” as DJ
KROV-FM in San Antonio is preparing to unveil a new DJ who will play music, give weather and traffic updates, and provide banter between songs. The only catch is that this particular DJ is a “virtual assistant” computer program that can be purchased for a mere $200.

You can listen to an example of the program’s capabilities over at its vendor website. It’s nowhere close to sounding authentically human, but if all it needs to do is mention names of songs and musicians and give the occasional news update, I’m sure people will deal with it. And the fact that it’s an off-the-shelf piece of software that’s been adapted to fill the role of an on-air personality is kind of neat, too, in a hacker sort of way.

**MIT develops software to decipher ancient text**

Handwriting recognition

The technique by which a computer system can recognize characters and other symbols written by hand in natural handwriting. The technology is used for identification and also on devices such as PDA and tablet PCs where a stylus is used to handwrite on a screen with a stylus, after which the computer turns the handwriting into digital text.
IBM has big plans for Watson post-Jeopardy!

Written on February 15, 2011 by Eric Tatro in Artificial Intelligence

So it’s official – IBM’s Watson has proven itself capable of beating the best humans have to offer the world of televised trivia contests, which is all well and good, but what’s next? After all, we can’t expect the machine to retire on those sweet, sweet Jeopardy! winnings, which are going to charity.

According to Dr. John E. Kelly III, Senior VP at IBM, Watson’s ability to “sift through massive amounts of information to get to answers that are relevant” will likely first find a use in the health care industry to help doctors. Kelly also notes companies from the financial, insurance and
retail industries have come away “incredibly excited” at the possibilities Watson may provide their respective businesses.

Going from winning a game show to helping save lives and money? Not bad work for a supercomputer – but Watson had better get cracking if IBM expects to recoup the estimated $900 million – $1.8 billion it cost to build.

Source: CNNMoney
Photo: Citizen IBM