

Frequently Asked Questions

Q1:

What is Emergent Intelligence Technology?

A1:

Emergent Intelligence Technology is technology for *managing complexity* in business, social, administrative, health care, educational, security and defence environments. It comprises *knowledge* (concepts, principles, methods) as well as appropriate *software tools* for modelling and solving complex problems.

Q2:

What is Complexity?

A2:

A situation, problem, issue or a system is considered to be *complex* if it satisfies the following conditions:

- It consists of a large number of diverse autonomous interconnected components
- It has no central control
- Its global behaviour emerges from the interactions of local behaviours of its components and is unpredictable although it follows discernable patterns

Examples of complex systems include: the Internet-based global market; a global network of financial institutions and the Internet-based information society. Hostile complex systems include: epidemics; terrorist networks; networks of spamming and hacking activists.

Q3:

What is Intelligence?

A3:

Intelligence is the capability of achieving desired goals under conditions of complexity, that is, when the environment changes frequently and unpredictably. Without intelligence it is not possible to manage complexity or to solve complex problems and therefore it is important to design organisations and supporting IT (information technology) to be intelligent and to harness human intelligence by engaging them in teamwork rather than controlling them in rigid organisational hierarchies.

Q4:

What is Emergent Intelligence?

A4:

Emergent properties of complex systems are those properties that emerge from the interaction of components and do not exist in constituent components themselves. Intelligence is an emergent property of a complex system because it is not present in system components and is created by the interaction of these components. For example: (a) human intelligence is an emergent property of neural networks in our brains where billions of neurons exchange information among themselves; (b) artificial intelligence emerges in

software where hundreds of thousands, or even millions, of software agents exchange messages with each other; (c) organisational intelligence is in evidence where teams of people are engaged in collaborative/competitive problem solving.

Q5:

How do we manage complexity?

A5:

By using intelligence of individuals, organisations and software to *adapt* to continuously changing conditions in the environment in which we live and work (e.g., social situations, markets) and to develop *resilience* to attacks from hostile systems (e.g., epidemics, terrorist activities, spamming, hacking, electronic attacks).

Q6:

What are the examples of complex business situations, which require intelligent solutions?

A6:

Any business supplying services or products to the Internet-based global market is, by definition, in a complex situation. The global market is a complex system with exceedingly large numbers of autonomous suppliers, customers and investors engaged in competition, collaboration or trading with each other, and with a rapid access to information on demand and supply fluctuation. In the modern global marketplace orders arrive at any time and are frequently changed or cancelled – in some industries every hour or two, in others even more frequently. This makes every business process of an organisation engaged in global market vulnerable to frequent changes in demand and supply. This is particularly true for supply chains, logistic systems, manufacturing processes, spare-parts inventories, servicing and repair systems and the like. Market uncertainties underline the need for business intelligence, demand/supply forecasting, learning from experience and semantic searches.

Q7:

What are the examples of complex social situations, which require intelligent solutions?

A7:

The complexity of global economic system is reflected in all aspects of social systems. Laws, rules and regulations, as well as, health care methods and facilities, change frequently and therefore there is a need for a rapid and reliable access to relevant and up-to-date government and health care information, hence the need for intelligent semantic search and for smart-card based social support and health care systems.

Q8:

What are examples of hostile complex situations, which require intelligent solutions?

A8:

Hostile complex systems tend to launch surprise attacks and therefore an early detection is the key aspect of resilience to attacks. An early detection of attacks (e.g., electronic attacks on financial institutions) can be achieved by monitoring information on relevant behavioural patterns (e.g., access to accounts) and detecting unusual activities (e.g., rapid transfers of funds to external accounts). Improving our understanding of hostile environments, on the other hand, requires constructing structural models of these environments (e.g., building virtual epidemics) and simulating their behaviour.

Q9:

What is Multi-Agent Technology (MAT)?

A9:

MAT is technology for creating intelligent software systems capable of managing complexity and solving complex problems. The key components of a multi-agent system (MAS) are: (a) Ontology, which is a repository of conceptual problem domain knowledge; (b) Virtual World, which is a model of the domain of the real world that is being managed, and which is populated by Software Agents that consult Ontology and negotiate among themselves how to manage the situation under consideration.

Q10:

How can MAT create competitive edge for businesses?

A10:

Agent based software can solve complex business problems that no other technology can solve. Here are three examples. (a) The first is scheduling of London taxis. Because of the dynamic nature of rapidly changing demand the problem could not be solved by straightforward optimization solutions. Scheduling of 2,000 vehicles in a city of the size of London where there is a need to find the most economical vehicle to pick up a customer (out of 2,000 vehicles distributed around an area of 30 miles in diameter) without disturbing unaffected parts of the previously agreed schedule is a very complex business problem. All conventional schedulers have to re-start the whole optimization process whenever a new demand arrives (which, in the case of London, is every 2 minutes on average). In contrast, agent based schedulers are capable of re-scheduling only affected vehicles and they can accomplish this in the case of London taxis in about 2 minutes. (b) The second example is scheduling of large sea going crude oil tankers. Here the problem is rather different because there is a need to schedule heterogeneous objects (each tanker has a unique set of attributes and owner preferences) and this precludes the use of straightforward optimizing solutions. (c) The third example is the distribution of cars to rental locations across Europe for one of the largest car rental companies in the world, which is perhaps one of the most difficult scheduling problems that one can think of. Here there is the need to schedule simultaneously cars, drivers and servicing facilities in the face of perpetually changing demands and, in addition, the scheduler has to take into consideration feedback or (lack of feedback) from drivers when they receive instructions from software agents.