

Εισαγωγή στο Διαδίκτυο των Αντικειμένων !

Πίνακας περιεχομένων

1. Articles-and-Papers	2
2. Links-and-Apps	2
2.1. IoT	2
2.2. Network	2
2.3. Apps	2
2.3.1. Smart City	2
2.3.2. Exoskeleton	3
2.3.3. Military	3
2.3.4. Sports	3
2.4. Misc	3
2.5. DiY	3
3. Swarm	4
3.1. The Five Principles of Swarm Intelligence	4
3.2. The Five Principles of Swarm Intelligence (Video)	5
3.3. Swarm Apps	5
3.3.1. Harvard Universityi (thousand tiny robots)	5
3.3.2. Intel's Shooting Star Drone	5
3.4. Swarm intelligence approaches	5

Ορισμός, βασικά χαρακτηριστικά και αρχιτεκτονικές IoT, εφαρμογές IoT, αντιδιαστολή με τον ιστό των αντικειμένων (Web of Things / WoT), προκλήσεις του IoT όπως προτυποποίηση, κλιμάκωση, μέγεθος συσκευών, κατανάλωση ενέργειας, διευθυνσιοδότηση, ασφάλεια/ιδιωτικότητα, ποιότητας υπηρεσιών, κινητικότητα κ.α

Δομή και τεχνολογία κόμβων. Αρχιτεκτονική και τοπολογίες. Πρότυπα και πρωτόκολλα φυσικού επιπέδου. Θέματα διανομής, επικοινωνίας και οργάνωσης. Πρωτόκολλα δρομολόγησης. Ενεργειακά αποδοτικοί αλγόριθμοι συλλογής και επεξεργασίας δεδομένων.

Μελέτη εφαρμόγων στους τομείς της υγείας, έξυπνα σπίτια και πόλεις, γεωργία ακριβείας, μεταφορές, βιομηχανικές εφαρμογές κ.α. Ενδεικτικά παραδείγματα σχεδίασης εφαρμογών (case studies).

1. Articles-and-Papers

- Networked objects and smart devices
https://www.theinternetofthings.eu/sites/default/files/Rob%20van%20Kranenburg/networked_objects.pdf
- Privacy of the Internet of Things
<https://arxiv.org/pdf/1611.03340.pdf>

2. Links-and-Apps

2.1. IoT

- IoT - Explained in less than 3 minutes
▶ <https://www.youtube.com/watch?v=GifWNtMfYvk> (*YouTube video*)
- Internet of Things explained simply
▶ <https://www.youtube.com/watch?v=uEsKZGOxNKw> (*YouTube video*)
- How It Works: Internet of Things
▶ <https://www.youtube.com/watch?v=QSIPNhOiMoE> (*YouTube video*)

2.2. Network

- Network Topologies (Star, Bus, Ring, Mesh, Ad hoc, Infrastructure, & Wireless Mesh Topology)
▶ <https://www.youtube.com/watch?v=zbqrNg4C98U> (*YouTube video*)
- Mesh Routing
▶ <https://www.youtube.com/watch?v=Kjrib-BflHw> (*YouTube video*)
- How a DNS Server (Domain Name System) works.
▶ <https://www.youtube.com/watch?v=mpQZVYPuDGU> (*YouTube video*)

2.3. Apps

2.3.1. Smart City

- Connected Vehicle: The Future of Transportation
▶ <https://www.youtube.com/watch?v=Q8Cn47L8FRQ> (*YouTube video*)
- Communication protocols for Vehicular Ad hoc NETWORKS (VENG)

▶ <https://www.youtube.com/watch?v=14fOqMBn9aw> (YouTube video)

- Solution to Traffic

▶ <https://www.youtube.com/watch?v=iHzzSao6ypE> (YouTube video)

2.3.2. Exoskeleton

- Exoskeleton

▶ <https://www.youtube.com/watch?v=qTxxwLWsMoA> (YouTube video)

2.3.3. Military

- Military Robots

▶ <https://www.youtube.com/watch?v=JGNopwFcz3A> (YouTube video)

2.3.4. Sports

- 3D Tracking with IMU

▶ <https://www.youtube.com/watch?v=6ijArKE8vKU> (YouTube video)

- Usain Bolt

<https://www.facebook.com/Eurosport/videos/10156447549454745>

- Wearable Sports Tech for Future Champions

▶ <https://www.youtube.com/watch?v=dIyhUE1Jt9s> (YouTube video)

- The Duel (Now)

▶ <https://www.youtube.com/watch?v=ive4sKkpCqs> (YouTube video)

- The Duel in the near future

▶ <https://www.youtube.com/watch?v=tIIME8-au8> (YouTube video)

2.4. Misc

- Why Industrial IoT..?

▶ <https://www.youtube.com/watch?v=S352lyPZP00> (YouTube video)

2.5. DiY

- Motion Tracking Using IMUa - I

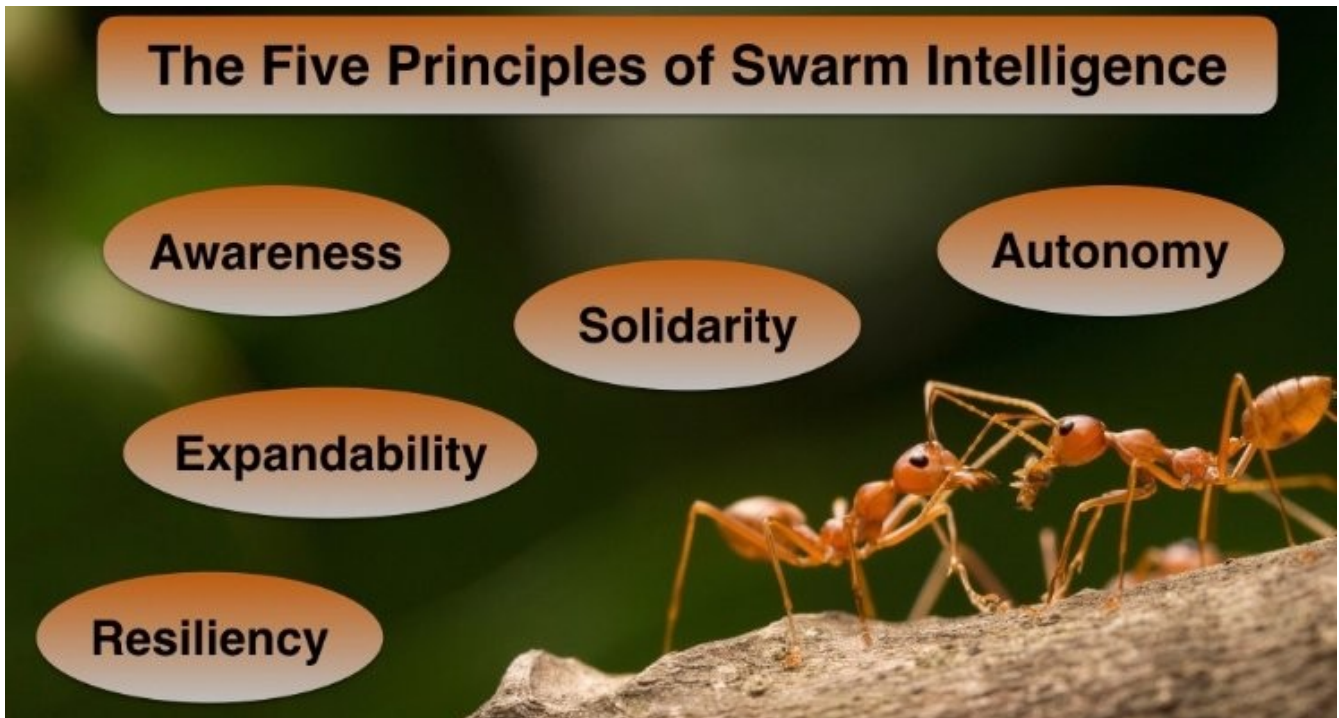
▶ https://www.youtube.com/watch?v=6QJ_3lJSh8w (YouTube video)

- Motion Tracking Using IMU - II

▶ <https://www.youtube.com/watch?v=JzMaCKzWyiY> (YouTube video)

3. Swarm

3.1. The Five Principles of Swarm Intelligence



- Awareness

Each member must be aware of its surroundings and abilities.

- Autonomy

Each member must operate as an autonomous master (not as a slave;) this is essential to self-coordinate allocation of labor.

- Solidarity

Each member must cooperate in solidarity: when a task is completed, each member should autonomously look for a new task (leveraging its current position.)

- Expandability

The system must permit expansion where members are dynamically aggregated.

- Resiliency

The system must be self-healing: when members are removed, the remaining members should

undertake the unfinished tasks.

3.2. The Five Principles of Swarm Intelligence (Video)

- Five Principles of Swarm Intelligence

▶ <https://www.youtube.com/watch?v=axxXz2BM0yw> (YouTube video)

3.3. Swarm Apps

3.3.1. Harvard University (thousand tiny robots)

Harvard University scientists have developed about a thousand tiny robots that, like swarming bees or army ants, can work together in vast numbers without a guiding central intelligence

- Programmable self-assembly in a thousand-robot swarm

▶ <https://www.youtube.com/watch?v=xK54Bu9HFRw> (YouTube video)

More Info: <https://www.seas.harvard.edu/news/2014/08/self-organizing-thousand-robot-swarm>

3.3.2. Intel's Shooting Star Drone

The Shooting Star system is designed for light shows, so it will initially be used for entertainment, such as shows at theme parks, sports stadiums, and large public events (Fourth of July, New Year's Eve, etc.). The show is a bit like battery-powered fireworks, but with Intel's brains behind the operation, fancy animation can be created in just a few days.

Each quadcopter weighs just over half a pound, with built-in LED lights that can create more than 4 billion color combinations. The system's algorithms determine where drones should be placed and optimize the flight path. An entire fleet of hundreds of drones can be controlled by a single computer.

- Programmable swarm light show

▶ https://www.youtube.com/watch?v=aOd4-T_p5fA (YouTube video)

More Info: <https://www.zdnet.com/article/500-intel-drones-dance-in-the-night-sky/>

3.4. Swarm intelligence approaches

- Intel's Shooting Star Drone Each member is controlled through a central computer
- Harvard University Each member behaves autonomously without a central computer

Both approaches have merits and limitations.

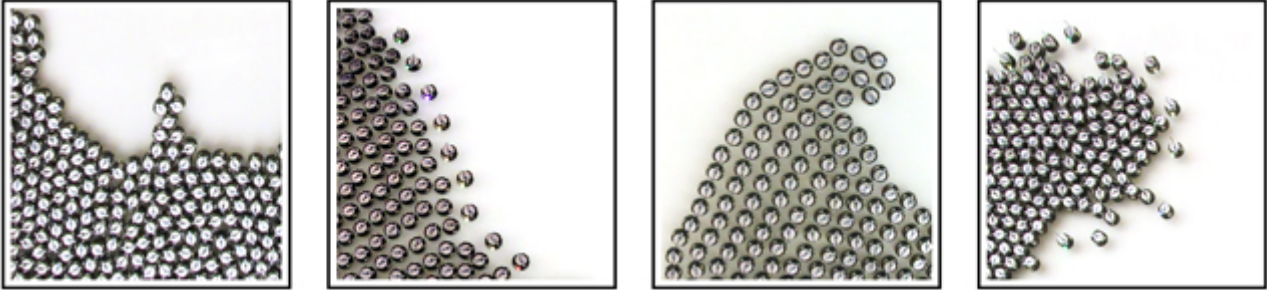
In the case of "a" above, members are slaves in a system controlled by a central computer with sufficient channels of communication. The results can be visually spectacular, as illustrated by

Intel's drones. However, since a central computer dictates the movement of each member, there is limited flexibility to adapt to changing environments



vulnerability due to single point of failure

In the case of "b"



In a swarm of a thousand simple robots, errors like traffic jams (second from left) and imprecise positioning (far right) are common. (Photo courtesy of Mike Rubenstein and Science/AAAS.)

[origin](#)



Reminder

Caminante, no hay camino,
se hace camino al andar.

Wanderer, there is no path,
the path is made by walking.

Antonio Machado Campos de Castilla