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## Alfonso Iniguez

*Swarm Technology, USA*

## Distributed artificial intelligence in robotics

**Background:** Various companies and academic institutions are actively researching the field of swarm robotics. A survey on the topic reveals two distinct approaches: A. Each swarm member behaves autonomously without a central computer e.g. Harvard University's 1024 Robot Swarm. B. Each swarm member is controlled through a central computer, e.g. Intel's drones showcased by Disney's light show and Super Bowl 2017.

**Description of the Problem:** In the case of A, the system falls into the realm of flocking behaviour. This system suffers from: 1. Awareness: Members are not aware of their available capabilities. 2. Autonomy: Members must be told what to do. 3. Solidarity: Members lack the ability to accomplish a mission using collective intelligence. In the case of B, members are slaves in a system controlled by a central computer. This system suffers from: 4. Expandability: Members cannot be added dynamically. 5. Resiliency: The system lacks the ability to self-heal when members are removed.

**Description of the Solution:** Alfonso Iniguez is the first researcher to design an architecture that complies with the five principles of swarm intelligence: 1. Awareness: Each member is aware of its available capabilities. 2. Autonomy: Each member operates autonomously; this is essential to self-coordinate allocation of labour. 3. Solidarity: Each member continuously volunteers its available capabilities until the mission is accomplished. 4. Expandability: Members can be dynamically aggregated ad infinitum. 5. Resiliency: Members can be removed while the system self-heals ad infinitum. The proposed solidarity cell architecture goes beyond flocking behavior and spectacular light shows. The technology will enable unmanned ground-air reconnaissance missions, precision farming, manufacturing robots, autonomous fleet management, and interplanetary exploration.

### Biography

Alfonso Iniguez is the founder of Swarm Technology, which is a company that focuses on intent-based computing and swarm robotics. He has published research papers in the areas of distributed artificial intelligence, computer modeling and design verification. Using inspiration from ants and octopuses, he originated the five principles of swarm intelligence. His patented technology enables dynamic addition of processors for uninterrupted distributed processing within intent-based IoT edge processing and swarm robotics. He has worked in diverse engineering positions within: Motorola, Free scale, Integrated Device Technology, and Microchip Technology. He holds a MS degree in Electrical Engineering from the University of Arizona, and a BS degree in Computer Engineering from the Universidad Autónoma de Guadalajara, Mexico.

alfonso@swarmtechnology.us

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