NSF-ATE Principal Investigators Conference, Washington, DC, October 2019

Technical Training: Smart Manufacturing For America's Revolutionizing Technological Transformation (SMARTT)

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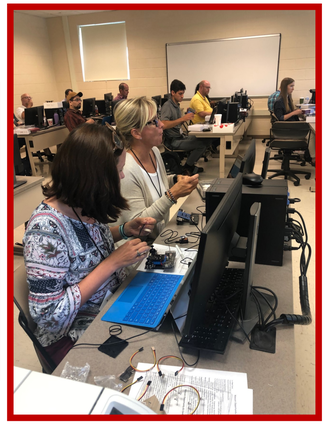
Introduction to Project

In this project, the following products were produced as a result of this project:

- **Smart Manufacturing training workshops**
- **Online Educational modules on Smart Manufacturing**
- **Industrial speaker short talks that present the State-of-the-art Industrial Applications**
- **Peer-reviewed articles were produced.**
- **High school and Middle School visits**

. In the hands-on training, we demonstrated the use of code -programmed drones in technical education and Smart Manufacturing (SM).

. Unmanned aerial and ground vehicle technologies are increasingly finding applications in industrial settings. Training on SM is achieved by using coded drones, with educational modules and a database of technologies and their applications.



Technical Training Workshops

Summer 2019 Smart Manufacturing Workshops:
Farmington, CT workshop participants (Left). Smyrna, TN participants (Right)

- **Technical Training Workshops included four parts:**
  - ◊ **Industrial Speakers:** speakers came from Nissan, Bridgestone North America, Kasai, and other major manufacturers that employ Smart Manufacturing.
  - ◊ **Scientific Research Speakers:** Invited speakers presented the latest research in Smart Manufacturing.
  - ◊ **Industry Tours**
  - ◊ **Hands-on Training:** In the hands-on training, we demonstrated the use of code -programmed drones in technical education and Smart Manufacturing (SM). Python language was used to program the Arduino– controlled drones. Participants learned to assemble the controller and connect the joysticks, SmartInventor Board, RoboLink ByRobot Board and the wires to control your Drone. With the following modules: Accelerometer, Barometer, IR senors, Optical flow sensors, Easy introduction to Arduino and Python code based programming.
  - ◊ Use of libraries and code to produce tasks for drones.

Applications of Drones in Manufacturing:

- ◊ Drones are making smarter manufacturing processes, by connecting to other machines and central control centers [2].
- ◊ Increase connectivity between machines in a plant
- ◊ Using drones with programmed directives in them can help to lower production cost and time by reducing human error and fatigue, the current technology is evolving and adapting to new manufacturing processes.
- ◊ Using code-based drones to simulate Smart Manufacturing processes can help aid in production and efficiency.
- ◊ Can help to alleviate areas that might be hazardous or cause loss of efficiency.

Publications

- Low-Cost Remote Supervisory Control System for an Industrial Process using Profibus and Profinet, Y Musa, O Tantawi, V Bush, B Johnson, N Dixon, W Kirk, K Tantawi, Proceedings of IEEE Southeastcon 2019 [3]
- Status of Smart Manufacturing in the United States, KH Tantawi, I Fidan, A Tantawy, 2019 IEEE 2019 SoutheastCon, Hunstville, 2019 [4]
- Transforming Industry towards Smart Manufacturing in the United States, R Arnold, I Fidan, K Tantawi, National NSF-ATE Conference 2018 [5]
- Low-Cost Remote Supervisory Control System for an Industrial Process,Y Musa, O Tantawi, K Tantawi, NSF-ATE Nat'l Conf. [6]

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[2] Boughton, Paul. (2 May, 2017). EngineerLive. Retrieved from https://www.engineerlive.com/content/future-drones-manufacturing on October 8, 2019.

[3] Y Musa, O Tantawi, V Bush, B Johnson, N Dixon, W Kirk, K Tantawi, "Low-Cost Remote Supervisory Control System for an Industrial Process using Profibus and Profinet", 2019 SoutheastCon, Huntsville, AL 2019 **DOI:** 10.1109/SoutheastCon42311.2019.9020630

[4] KH Tantawi, I Fidan, A Tantawy, "Status of Smart Manufacturing in the United States", 2019 SoutheastCon, Huntsville, AL April 2019 **DOI:** 10.1109/SoutheastCon42311.2019.9020330

[5] R Arnold, I Fidan, K Tantawi, "Transforming Industry towards Smart Manufacturing in the United States" National NSF-ATE Conference, Washington, October 2018

[6] Y. Musa, O. Tantawi, K. Tantawi, "Low-Cost Remote Supervisory Control System for an Industrial Process", NSF-ATE National Conference, Washington, DC, October 2018

Acknowledgement

This project is funded by the National Science Foundation, Advanced Technological Education program, NSF Award # 1801120