

Germany and Industry 4.0

Experiences and Takeaways from studying Industry 4.0, ROS, and 3D Printing in Germany

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This summer, I lived in Aachen, Germany as I participated in the Industry 4.0, 3D printing, and ROS (Robotic Operating System) Summer Schools held by Aachen University of Applied Science. Thanks to the College of Engineering and the study abroad office, I was able to earn course credit while learning about these hot topics in engineering, while experiencing life in Germany! Each topic was explored through lectures in the morning, practical sessions in the afternoon, and visits to local sites such as DHL, Materialize, and the Fraunhofer Institute. These courses totaled 5 weeks, but my brother and I traveled through Germany to Austria and the Northern Alps during the 2 weeks before their start. Through exploring with my brother and living in Aachen, I made great memories and friends that are sure to last a lifetime. In this talk, I'll be sharing both the concepts and technical details I learned through the courses, and my experiences studying and living in Germany this summer.

Industry 4.0 is what Germany refers to as the next industrial revolution, which, unlike the previous three industrial revolutions, is being brought about by around twelve rapidly advancing technologies. I'll talk about lean processes, the economic drivers of Industry 4.0, RAMI 4.0, and practical implementations of these principles (both industrial and DIY).

Additive manufacturing, or 3D Printing, comes in a variety of forms and is quickly expanding the possibilities of design, allowing for custom, complex geometries that are nearly impossible to create using subtractive manufacturing. 3D printing also has great potential in lean management and is one of the disrupting technologies of Industry 4.0. I'll go over the different types of additive manufacturing, their best uses, and implications for their use in Industry 4.0 and lean manufacturing.

The robotic operating system (ROS) is an open source meta-operating system that allows for low-level device control, message passing, and package management. With a worldwide community developing it, ROS is quickly growing and being used commonly for many different applications, branching from research environments into commercial applications. Recent development of ROS2 and ROS Industrial focus on reliability and real-time system control. I'll present the basic capabilities of ROS, its framework, applications, and share some of my experience with it.