CS3012

Biography of an Influential Software Engineer

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# Kathleen Antonelli – The mother of computer programming

She was born on the 12th of February 1921 as Kathleen McNulty in the small village of Creeslough in Donegal. On the night of her birth her father James McNulty, who was a member of the IRA was arrested by the British and imprisoned in Derry Gaol. When he was releases two years later he emigrated to Philadelphia, USA with his family.

Throughout her school and college years she took every mathematics course she could and graduated in 1942 from Chestnut Hill College with a degree in mathematics, which was very uncommon at the time.

Soon after graduating she was hired as a “human computer” at the Ballistic Research Laboratory in which she used mechanical desk calculators to compute trajectories for artillery firing tables. She eventually was moved to work on the differential analyser (Invented by Vannevar Bush of MIT), the largest and most sophisticated mechanical calculator of the time, this allowed the work done previously with the desk calculators to be cut down from 40 hours to about 50 minutes. She was promoted to supervising calculations of the differential analyser.

The Electronic Numerical Integrator and Computer or ENIAC was the first general purpose electronic digital computer, it was Turing-complete and could be reprogrammed to solve a large quantity of problems. It was developed from 1943-1946 by John Mauchly and J. Presper Eckert to perform the same ballistics trajectories calculated by the differential analyser. In 1945 Kathleen was selected to be one of its first programmers along with several other women from the computer corps. She received training at the Aberdeen Proving Grounds in IBM punched card equipment that was used as the I/O system for the ENIAC. The ENIAC could compute the same Ballistic trajectory calculations in about 10 seconds as the older system. It was the women’s responsibility to determine the sequence to steps required to complete the calculations for each problem and set up the ENIAC accordingly, which could take days to swap out various switches and vacuum tubes and verify the electrical connections to avoid any error.

The ENIAC was programmed using subroutines, nested loops and indirect addressing for both data locations and jump destinations. During her work programming the ENIAC, Kathleen is credited with the invention of the subroutine, she proposed the idea to solve the problem where logical circuits did not have enough capacity to compute some trajectories.

Blueprints were used to program the ENIAC as the programmers were not allowed into the room at first as it was a classified project. Programming involved discretising the differential equations involved in a trajectory problem, having completed the program they were allowed in to physically program the computer.

The ENIAC was not used for just the trajectory calculations. It was helped to aid the development of the hydrogen bomb. It calculated the distance neutrons would travel through various materials.

She later moved to the Aberdeen Proving Grounds, along with ENIAC in 1947, and in 1948 she married Jon Mauchly, one of the creatures of the ENIAC.

Later in life she continued to talk about the ENIAC by writing articles and giving talks about it. Although she did not receive recognition for her efforts during the heyday of the ENIAC she was later inducted into the Women is Technology International Hall of Fame in 1997. In 2017 the School of Computing in DCU was renamed in her honour to the McNulty Building.