Remembering Percy Ludgate, Ireland's first computer scientist

In 1914 the Corkman described a completely novel mechanical computer

about 5 hours ago

Chris Horn

LISTEN NOW 5:45

At an international maths conference in Edinburgh in July 1914, a remarkable Irishman made an astonishing claim. Percy Ludgate, born in Skibbereen and then living in Drumcondra in Dublin, described a completely novel mechanical computer.

His design was entirely original and could solve any computation problem (like today's computers). He had published in the Royal Dublin Society in 1909, and some of his designs were also published in an English magazine of mechanics and science. The day after the conference, July 28th, Austria-Hungary declared war on Serbia and the first World War began.

Charles Babbage is renowned as the designer of the first mechanical computer in the 1820s. At the time, mathematical tables were critical for marine navigation but were manually calculated and often wrong. With support from the British admiralty, the English mathematician devised a machine which could compute trigonometrical values to remarkable accuracy simply by cranking a handle to turn its cog wheels.

Each wheel had 10 teeth, representing the digits 0-9. His "difference engine" could work with 20 digit numbers (20 cog wheels per number) and compute using algebraic functions up to the sixth power (a number multiplied by itself six times).

Initially given £1,700 (about €162,000 today) by the British government, by the 1830s Babbage had then spent 10 times that amount from the government along with a further £6,000 of his own money. He never managed to construct his machine, chiefly because the metal working available then was insufficiently precise to make the intricate parts. In 1991, a scale model of Babbage's machine with about 2,000 metal parts verified the viability of his design at the London Science Museum. A complete working model, with 11,000 parts, is today exhibited at the entrance to the Computer History Museum in Silicon Valley in the US.

RELATED

Ireland central to new EU deal on Pfizer vaccines

Draper Esprit leads $30m funding round for Cervest

EasyJet plans to fly only 15% of pre-pandemic schedule

Inside Business with Ciaran Hancock · Ransomware: how big is the threat to Irish companies?

In 1834, Babbage proposed a more complex machine, his "analytical engine". It used 50 digit numbers (50 cog wheels per number) on 2.5m diameter ring gears. Unlike his earlier designs it also had a memory system which could hold up to 1,000 numbers and, if constructed, would have been 150m long. Unlike his more limited "difference engine", it could solve any computation problem.

Inspired by the patterns programmable by punched cards in Jacquard's fabric loom of 1801, Babbage used punched cards to direct his machine. Ada Lovelace, now recognised as the world's first computer programmer, wrote of Babbage's machine: "We may say most aptly that the analytical engine weaves algebraical patterns just as the Jacquard loom weaves flowers and leaves". He spent the rest of his life trying to raise funds for his invention, building a number of partial prototypes.

Different

Almost a century later, Ludgate strongly asserted that he was unaware of Babbage's work. Certainly, the Corkman's designs are completely different from anything Babbage invented. Rather than cog wheels to represent each digit, Ludgate proposed rods with 10 stepped notches, representing the digits 0-9. Twenty-one such rods were held together in a shuttle, with the first rod indicating whether a number was positive or negative, and the remaining 20 rods representing 20 digits of the number.

His storage system had two concentric independent rings. The outer held 128 shuttles (signed 20-digit numbers), and the inner 64. By rotating the rings, two 20-digit numbers could be presented by the storage system to the arithmetic unit, which mechanically sensed how far each set of rods protruded from their shuttle.

While the Babbage arithmetic unit could only add (with multiplication requiring the requisite number of consecutive additions), the Ludgate arithmetic unit had at its core both addition and multiplication. Both designs had the ability to make decisions on whether an arithmetic outcome was positive, negative or zero. Ludgate, however, also proposed to re-use previously programmed algorithms as stepping stones to more complex computations. Today's computers use "subroutines" to the same purpose.

Most impressively of all, the Ludgate design was small and compact – the entire design fitted into a quarter of a cubic metre, about the size of a small fridge. Unfortunately, his design has yet to be constructed and verified.

First computers

The first fully operational computers were built in extreme secrecy during the second World War. An electro-mechanical computer was constructed by Konrad Zuse in Berlin in 1941 to design guided missiles, and then a fully electronic computer was built in 1943 by Tommy Flowers and Alan Turing at Bletchley Park outside London for breaking encrypted codes.

Dr Brian Coghlan at Trinity College Dublin has conducted extensive research on the life and work of Ludgate, and much of it is available online. Prof Brian Randell at Newcastle University has also joined the discovery of Ludgate's foundational and highly creative work, and co-authored a number of international journal papers and talks, most recently at Bletchley Park.

Next year, will be the centenary of the passing of Ireland's first computer scientist, Percy Ludgate. Ireland should rightly celebrate and honour his memory as an extraordinary genius.