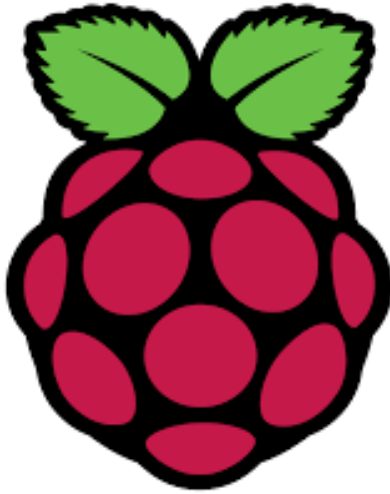
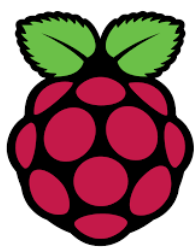




element14

Improving Quality of Life Using Raspberry Pi





HOW RASPBERRY PI IS PLAYING A VITAL ROLE IN IMPROVING THE QUALITY OF LIFE FOR PEOPLE WITH DEMENTIA

Case Study Q&A

Oliver von Fragstein and Maximilian Kaiser from the Hochschule Düsseldorf University of Applied Sciences explain why the Raspberry Pi single-board computer was the ideal choice for their work in supporting people who are living with dementia.


WHAT DOES YOUR ORGANISATION DO?

The Hochschule Düsseldorf University of Applied Sciences is one of the largest universities of its kind in the German Federal State of North Rhine-Westphalia. The university has seven faculties delivering 36-degree programmes to around 10,000 students.

In the Faculty of Electrical Engineering, we work on informatics and embedded systems and how they can help in student education. We deliver research and industry projects that are based in the real world and address the problems of society. We bring these issues into the classroom and our aim has always been to make projects far more interesting for students than simply using development boards and evaluation kits.

WHERE WAS RASPBERRY PI USED?

In 2013-14, one of the projects we started to work on was called NutzerWelten, which aimed to help people suffering from the early stages of dementia to get the maximum benefits out of assisted living. We wanted to design hardware and implement a software framework that would help people with dementia to live their everyday lives better.



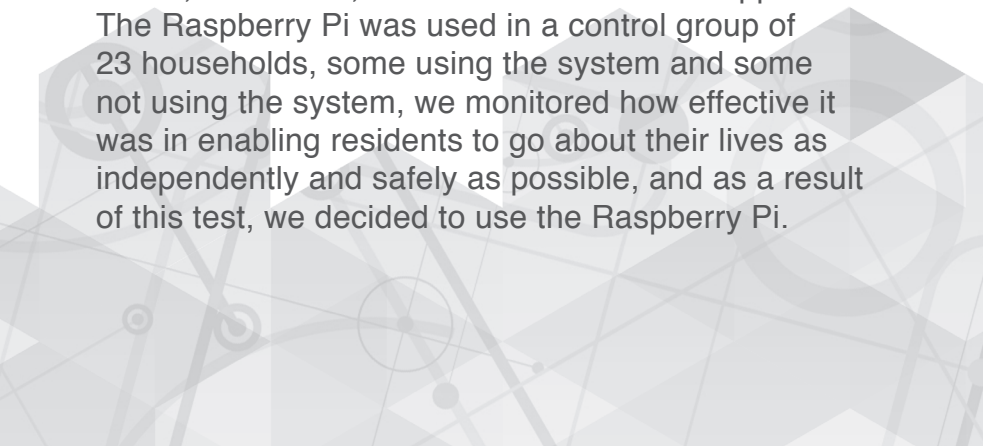
That's why we called our work NutzerWelten – which means ‘the world of the user’ – because the main criteria of the whole project was to put the user at the centre of everything we were working on. To this end, the project was carried out in conjunction with other faculties, most importantly the Faculty of Social Research.

We found there was a clear need to use technical devices to help people with dementia, for example, in finding a person if they were lost or in helping them to get back to their room if living in a care home environment. However, more than this, the fundamental goal of our project was to set up a complete support system for the whole home or living space, especially when a person wanted to live on their own and not in a supervised living environment.

Safety is a prerequisite for maintaining independence, so we were not just interested in checking if the person had fallen but also if they might have left the oven on or if they had closed all their windows and doors; did they perhaps leave the tap running in the kitchen or bathroom? We wanted to develop an all-in-one solution to prevent these things from happening and to provide all-round safety, empowering people to remain safe in their own home for as long as possible. At the same time, it was important that whatever system was in place could be accessed either by themselves or by the person's partner or carer with minimum difficulty.

HOW DOES THE RASPBERRY PI HELP YOU TO ACHIEVE YOUR GOALS?

In the current version of the NutzerWelten system, Raspberry Pi is the core or central component that brings all the technical devices together in the home and is, in a sense, the server for the whole application. The Raspberry Pi was used in a control group of 23 households, some using the system and some not using the system, we monitored how effective it was in enabling residents to go about their lives as independently and safely as possible, and as a result of this test, we decided to use the Raspberry Pi.



WHY DID YOU CHOOSE THE RASPBERRY PI AND DID YOU CONSIDER ALTERNATIVES?

NutzerWelten's predecessor – which focused on elderly people in general and not specifically on those with dementia – used an all-in-one PC, which was a combination of a TV and a computer.

However, when we began this project we had no reliable data on the best tools to use to assist elderly people, what they would accept and what could be integrated into their homes. Many of the people were not digitally savvy, they didn't have PCs or smartphones, for example, and it was considered that the all-in-one PC would be the best interactive tool for them. So, we developed an assisted living platform based on this hardware and put these systems into people's homes.

Our colleagues from the Faculty of Social Research carried out a study which looked at how people interacted with the system and what effect it had on their quality of life, including their security and safety. The feedback was that the all-in-one PC was not the best solution – it was too obvious, too intrusive into their everyday lives. Also, it was not flexible enough; we needed a flexible solution because every home and every person is different, with different demands requiring different support.

For example, some people don't want to see the technical devices that are helping them while others expect to be able to physically touch and see the device. It was clear that we needed a solution that could be connected to a network and a smartphone to make it invisible or connected to a touch panel to be directly accessible. This meant we required a device that was small and very flexible but at the same time something that was easy to use, readily accessible but affordable. Cost is important to students as well as to elderly people.

We looked at various platforms and the choice was made very quickly because the Raspberry Pi was readily available, was cheaper than alternatives, and provided all the functions and all the communications protocols – essentially everything that we needed.

Also, many students were already very familiar with the Raspberry Pi. When you put all those factors together, the Raspberry Pi was the obvious choice.

HOW IMPORTANT WAS THE RASPBERRY PI COMMUNITY?

The community was very important because the people on there had already thought about the very same issues that we were looking at and what was needed. This helped to make our development cycle much shorter than it would otherwise have been.

Very often with this kind of project we have multiple groups of students working on the same problem and it is important that we are quickly able to distribute our current status, our latest version of the software framework. By using the Raspberry Pi we were able to access the latest data, say from a testing system, duplicate it on SD cards and distribute these to students so that they were all using the same revision. This meant that we were very efficient and flexible in our development cycle and the community helped a great deal on this front.

WHAT VERSION OF THE RASPBERRY PI ARE YOU USING?

We started with the Raspberry Pi 2, then we moved on to the Raspberry Pi 2 model B and then the Raspberry Pi 3 Model B with its wireless LAN and Bluetooth connectivity. Now we are using the Raspberry Pi 3 Model B+, with its built-in WiFi and quad-core processor offering vastly superior processing power. So, we have always been using the very latest model available. In the beginning, there was the issue that the Raspberry Pi 2 didn't have WiFi on-board but we were able to use dongles to get a connection. While this was quick and not especially problematic, it is definitely an advantage to have WiFi on-board.

Another advantage of the Raspberry Pi 3 Model B+ is that you can boot from a USB HDD as we had problems with SD cards when they were running 24 hours on our system. We spent a lot of time searching and carrying out tests to find a reliable SD card but now the ability to boot from a hard drive makes the system much more reliable and stable.

WHAT ABOUT THE FUTURE?

We had limited amount of money and time so the study was small but we still have plans to improve the system after we have evaluated the feedback we receive, working alongside the Faculty of Social Research.

Because the development of our framework was all based on open source technology it is possible that others could take our work into a commercial environment. When we originally started this project, we built all the equipment ourselves – including fall detection units, fluid sensors, contact sensors for doors and windows – and installed all the wireless communication systems ourselves. But more recently we have been working together with various companies so that we now use commercially available products, making it easier for people who are interested in our systems to take them to the next stage.

Because ease of use was an important factor, we are even hoping that people with dementia and/or their carers or family members could set up a system similar to the one we have developed, even if they are not technologically knowledgeable or have any experience in this field. If we can give people the software together with the Raspberry Pi and all the necessary components or devices, and provide them with simple instructions and basic steps to go through, they should be able to set up the whole environment themselves without having to delve too deeply into the technology. The Raspberry Pi certainly makes this a viable possibility.

WE'RE HERE TO HELP

In 2018, Premier Farnell launched the new Raspberry Pi 3 Model B+, the fastest and most powerful version yet, perfecting the already outstandingly successful Raspberry Pi 3 Model B. For more information on Raspberry Pi and Farnell element14, visit <https://uk.farnell.com/buy-raspberry-pi>



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