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A SURVEY ON IOT AUTOMATED PROTOTYPING WITH SENSOR NETWORKS FOR PÍ RASPBERRY

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ABSTRACT

By 2020, more than 25 billion devices would be connected via wireless communication. After the fast-growing market in the relevant market (IoT), low-power technologies (LPWA) have become popular. In various LPWA technologies the battery (NB) and a long distance (LoRa) are the biggest technology. Sensor networks on the Internet are many research applications (IoT). An important cost and resource problem in developing the JT Network Sensor solution is the prototype application. In this study, the unique form of Raspberry Pí-pc is widely used as one of the most used prototypes and is widely used in scientific research. In this article we discuss the technologies, the use and the types of problems that occur when Prototyping is a solution for sensor networks for Pí Raspberry. The current literature is examined by selecting the documents based on systematic literature research. Based on a thorough study of the selected studies, we received a series of sensor-based services using pine juice. Moreover, this research has highlighted topics such as online health and education that have expanded the research in a new way. Further research possibilities have been identified to use different technologies with individual on-board computers. In this article we offer a comprehensive overview of NB-IoT and LoRa as efficient solutions for connecting peripherals. LoRa has proven benefits in terms of life cycle, capacity and battery costs. Now NB IoT licenses offer QoS, latency, reliability and battery life.

Keywords*: Cloud technology, IoT, Long Range[LoRa], Narrow Band[NB].*

I. INTRODUCTION

Internet Things (IoT) is the expansion of internet services, which connects daily physical objects with a network. With this connection between the network and physical objects, you have access to remote sensor data and you can control the physical world remotely. First comment on the term "IoT" by Kevin Ashton in 1999. Atzori, Iera and Morabito investigated the areas "Internet Things" [1]. In this study the focus was on a derivation to the Wireless Sensors Network (WSN) solution. The basic characteristics of sensor networks have been combined in a survey carried out in 2002 [2]."Sensor networks" refer to autonomous distribution sensors that are used to monitor the physical environment, such as temperature or pressure. Sensor networks are a wide range of studies. For example, we recommend using embedded Linux for sensor networks [3] and introducing the simple model of a detector network [4]. The long-term wireless sensor networks with geolocation localization [5] and an energy-efficient algorithm for the sensor network [6] were also studied. The sensor networks have developed many possibilities, such as the one that was introduced in the gate study of the unpublished study [7].The individual on-board computers, such as Intel Galileo, Beagle Bone and Raspberry Pi, have cheap development devices for testing purposes or educational purposes. These are fully adjustable and adjustable and have the possibility to install small, cheap IoT devices [8]. The Wine Raspberry is the most common of these three in the research field based on keyword research. Prototype development is a technological area for increasing individual on-board computers. Often the development of prototypes is difficult and expensive because of the costs of hardware design, software design and development, as well as the production and construction of hardware. However, if you use an on-board computer, these costs can easily be reduced architecture of ioT is shown in the figure 1. The hardware solutions are already ready for use, such as Pí Raspberry, with software that is ready for use with embedded Linux. Moreover, many communities and user groups are available online where a developer can ask for help and support.Despite the potential of individual on-board computers, we currently have no known and tested picture of the pros and cons of

computers with one card. . The aim of this study is to close this research gap by mapping the current artistic situation and the use of individual on-board computers in prototype sensor networks. That is why we have found answers to the following research questions.

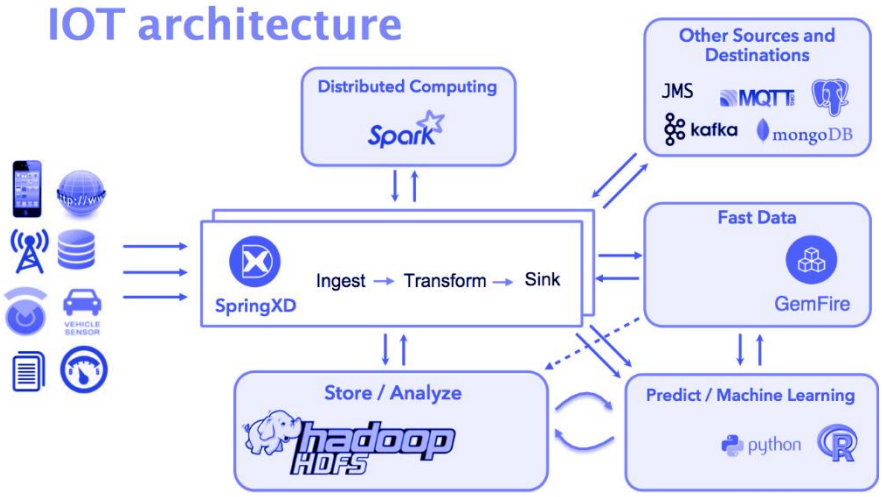

Fig:1 IoT Arcitecture.

RQ1: What do we know about the advantages and limitations of using a single computer with raspberries to support the work of the prototype?
RQ2: How is the functionality of these separate card systems tested?
RQ3: Are there specific test methods?

To answer these questions, we conducted a literature study. We used the systematic literature evaluation approach [9] for the collection of primary schools in this respect. The selected primary schools were then analysed and classified according to the analysis method of the subject.The rest of this document is structured as follows. Part II introduces the research approach used in this literature review. In Section III we analyse the presented results. Part IV contains discussions and recommendations for future research on the subject and finally summarizes the research in Section V.

II. VARIOUS APPROACHES FOR RESEARCH

As mentioned earlier, to answer the questions asked, we have decided to make a literature review to map the current information about this area. We have decided to use the SLR method to collect the relevant primary schools and to follow the guidelines of Kitchenham and Charters [9].

About the SLR camera, we make an electronic search decision. The database used was the Xplore IEEE Digital Library, which the search engine used in this study. The survey started with the selection of the following search terms: "Network sensors" and "Pipe Flip" Internet "E" We decided to use simple keywords to get a good coverage of potential primary schools. The keywords were used individually: "Juice Juice" returned more than 500 hits, "Internet of Things" returned more than 12,000 hits and the third keyword "Sensor Network" is the keywords that returned 110,000 hits. Together, the 11 key words (IEEE) and 1 (ACM) are returned. These are just searches on keywords. The total text search yielded too many responses, more than 400, for this search. This result, combined with the keyword 'smart home', however, looks up for 24 hours. The latest research focused on key words and was limited to research documents.In the first phase of the study, we selected studies based on the extract. We used the following complete and excluded criteria: we included peer-review conferences and conferences, as well as English articles that focus on all three elements. We have published studies written in languages other than English, posters, abstracts and short articles, in addition to studying but stating keywords, but not focusing on the problem.In the

second phase of the study carefully selected studies were read. At this moment we still have published studies, unless they focus on developing sensor networks.. In the end, we chose 15 primary studies to include in this study. The selected studies were read and analysed. We studied the technologies used, what were the previous problems, how the test was reported and whether there were problems to test or not. Finally, the comments were assessed and the results analysed.

In the other sections of this article we will present for the first time the most important studies selected in Part III. We then discuss where we respond to ongoing research problems.

Literature Survey

In total we have selected 15 primary school studies for this article. Primary schools receive and selected [10-24]. Below we will briefly summarize the most important surveys and their results.

Baranwal, Nikita and Pateiya [10] provide a monitoring system to detect and prevent rodents in grain reserves. The system consists of a webcam, a repelled for unwanted bars and Pí Raspberry with a series of sensors, which was an ultrasonic detector (URD) and passive infrared sensor (PIR). The algorithm has been introduced in the software. The test cases consisted of functional tests in which the hardware and software were tested. The test results showed that the viewing distance was small, seven hundred centimetres. In addition, the reliability of the system has been tested. This test shows that 85% of the system announcements were true. 15% of the failed tests due to the connectivity of the device, data transmission, notification and other factors such as PIR sensors are configured to generate discrete values.Two studies [11] and [12] presented the E-learning test bed based on IT technology, based on a combination of five Raspberry Pis sensors and microwaves. The test test was controlled by a number of factors: the vibrator operating seat, light control, odor control, audio control and remote control. The goal of improving and stimulating the motivation of the e-student was to use this test. The study used the Process Route Link Optimized (OLSR) technology in the test software. The first study brought the idea and the second study of the authors themselves had the same problem. In the second study, the test network communication was tested and the results were shown. The use of the test has not been tested to improve and encourage the encouragement of online students. Moreover, the functionality of the examiner has not been tested in addition to the communication protocol.The sensor screen Mahmoud and Qendri [13], the scene Sensoriana, gave Pí Raspberry. The goal was to change the wine cross in an IoT platform. This study can be classified as a material development. The lining of the sensor consists of light, speed meters, temperature, pressure and touch pad. Includes a TFT screen, lights, a real clock and memory for software development. This wing has been developed by the wire. However, the functional tests were not presented. The software test indicates that the firmware has been tested with the Raspbian operating system, but no test or result case has been reported.

The references [14] and [15] have focused on education in their research. The first study presented the challenges and experiences of IoT as an optional open course. The latter focused on teaching in Python programs. In these casesPis Juice and a range of sensors were used for educational purposes. The students of this course have made the prototypes using the material mentioned. These studies did not manage the protocols that were built and the emphasis was more on education than on other research in our research. However, these studies have been included due to the good data requirements of the systems.IoT care systems based on Maksimovic, Vujovic and Perisic [16]. Their research also emphasized the economic impact of IoT applications and the economic growth of health applications. This research compares the different applications: a V2.0 screen is an electronic health sensor for Juice Raspberry and the other is an adapted measuring system for the sensor. Ability to collect both data collection and transmission to the server application. This search is not special test but the research contributes to a large extent to the security problems of the collected data.

The research of Hsiao, Liang and Sung [17] introduced a smart home system. This system uses infrared communication in a room, Zigbee communication in house and WiFi communication for data transfer in the cloud. The purpose of the search was the combination of the types of communication in a system. The sensor or flow controller has not been introduced. The characteristics of these communication methods were also compared. A

comparison of the various means of communication was made at a general level, but no specific test case was presented.

Hentschel, Jacob, Singer and Chalmers [18] introduced a smart campus system based on Raspberry Pis. This system uses the hardware software service architecture, where the hardware consists of Raspberry Pis and sensors. This combination contains software for collecting and sending data. The cloud has a service where data is stored and served. This research presents sensor-sensor technology and delay-tolerant data transfer. This is for not so urgent data in case of interruption of network connectivity. This study described various applications of the system: room temperature, free meeting room, room occupancy, activation of customized events and support infrastructure for robots. These use cases are interesting, but the physical test cases for this are not described. There have been cases where an improved hardware design has been introduced by changing the type of sensors.

As before, systems based on the sensor network have been introduced in various studies [19-24]. These systems present the different ways to use the main node - solutions of the sensor node type. The model of a head node and multiple sensor nodes is common in all these studies. The sensor nodes collect the data and send it to the master node. The base node processes the data or sends it to the cloud service. These studies present systems from different angles or only focus part of the system. In these studies, test cases concentrated on functionality tests, communication tests or processing tests. These tests generally support the main ideas of the studies and the test cases that were not supported were discussed.

III. SURVEY OF IOT TECHNOLOGY

This study aims to solve the research questions: what do we know about the advantages and limitations of using the Raspberry Pi on-board computer with prototype work (RQ1); how the functionality is tested in these systems with a single card (RQ2); and, finally, are there specific test cases (RQ3). To answer the first research question, it can be said that a reasonable amount of research has been done into prototyping sensor networks with Raspberry Pi devices, but most documents have reported a single case study on Raspberry Pi. the development of an interesting system. There is a clear lack of formalized approaches, methods and tools.

The second research question focused on the practices used to test a prototype Raspberry Pi sensor network solution. Again, little information was reported on the test methods used, the problems encountered and the approaches used in the design. development of a sensor network or module therefor. Because checking the interconnections between nodes in IoT networks is of the utmost importance for the reliability of the system, the lack of studies is a worrying conclusion.

The third research question involved the use of specific test methods. This study shows that formal software tests were only used in a minority of searches. For example, it has often been mentioned that test cases have been exceeded. Of course, the components of the software are small, especially in the sensor nodes, but if the developed system has algorithms to process the collected data, the software can have other functions. These must be tested in a certain way. A good test is: will the software perform its functions within an acceptable time? Data validation tests were used in a minority of the studies. Validation can be important when a system uses the collected data or the results of the processed data in any way.

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The results of the RQ have resulted in several new research ideas. A possible research topic that is not covered extensively in this document is the embedded operating system. There are several types of single-board computers on the market and usually each device has its own operating system. These operating systems are mainly based on Linux. An interesting topic would be the variety or adaptation of these integrated Linux components when it comes to increasing computing power.

The second research theme focuses on reliability. Prototypes based on Raspberry Pi are usually associated with a series of experiments and soldering is not common. This follows from the investigations examined. In our previous studies [3], [4] and [5] there were connection errors and attempts were made to avoid them by soldering all possible connections. In the articles that were analyzed in this study, these reliability problems were usually not dealt with. Only a few of them mentioned these problems.

Another interesting topic is the recovery of an error. When we realized that reliability can be a problem, we need to think about how we can recover from the error and the types of errors that we can solve. The power failure is a common mistake. However, only a few studies have addressed this situation and the energy recovery process. Raspberry Pi and the widely used Linux operating system are sensitive to these types of errors.These selected studies tested systems that were developed in different ways. This study demonstrates the lack of systematic tests for such systems. Although there are systematic methods to test Raspberry Pi based systems, they have not been used. It can also be an interesting subject for future research.

IV. CONCLUSION

This research has shown that Wine Raspberry is a device that is widely used in the application of different types of research. Wine is a hacker that is fully accessible and can be registered and that supports many network devices and communication. Raspberry wine is therefore suitable for testing on small prototypes. This review of the literature focused on the use of sensor network solutions for a literature review. In this article three research questions were identified, which were answered with the systematic approach. The RQ1 response pointed to a lack of formal approaches, methods and tools. RQ2 emphasized the minimal use of methods and test methods, and the third RQ tried to use specific methods for the use of test methods. Many methods have been obtained: software testing, software performance testing and validation of data tests. Many other research themes have also been identified. This includes changes to the integrated operating system to improve performance, reliability or troubleshooting. In this research paper LoRa and NB-IoT have their advantages and disadvantages because of their different technological principles. In general, there is no LPWA technology, but the most suitable technology for the specific application. Each application has its specific requirements, resulting in a unique technology option. Their place is both LoRa and NB-IoT in the IoT market. LoRa focuses on cost-effective applications. In the meantime, NB-IoT is aimed at applications that require high and low QoS.

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