UDC 004.7

Victor Petrov,
Iryna Klymenko, Oleksandr Verba

METHOD TO IMPROVE EFFICIENCY OF MANUFACTURING ACTIVITY BY INTERNET OF THINGS TECHNOLOGY

The questions of increasing the efficiency of production activity by implementing the Internet of Things technology at the enterprise are considered. The method to use the Internet of Things and GPS technology to control and monitor the quality of personnel performance is proposed. Software in which the proposed method is implemented has been developed. The proposed tools of the Internet of Things can be integrated into the activities of enterprises. Using smartphones with the Android operating system has minimized the resources spent on achieving the effect of the proposed tools.

Keywords: Internet of Things, GPS, control, increase of efficiency

1. Relevance of the topic of research. In recent years, in various spheres of human activity such a notion as the Internet of Things (IOT) is gaining popularity. This technology allows you to display different devices in an open network so that they can interact with each other. IoT is also the ability to connect devices without human intervention, and most importantly - a large amount of data that generates and assembles devices, which can then be analyzed in order to be used in future for various needs, for example - increasing the comfort and business decision making.

2. Substantiation of research problems. At this stage of mankind's existence, population growth and technology improvement, the question arises of creating a productive way of correctly setting up diverse tasks and controlling their implementation. The Internet of things is the best suited for achieving such goals and their research - it will allow collecting and analyzing information that can be used already to meet the goals.

The article suggests the use of internet of things on the example of one of the enterprises that faced the problem of setting tasks and monitoring their implementation. The selected enterprise uses obsolete inefficient technologies in this matter, which use too much material resources and do not allow to compete normally in their market with other enterprises.

Having reviewed the enterprise and its methods of achieving the task, it was concluded that the emphasis should be placed on controlling the fulfillment of the tasks by the workers - this is an urgent question in this enterprise, as well as laying the foundation for technologies and algorithms that will allow to perform qualitative statement of tasks. That is why it was chosen to use tracking to solve the problem as a basis.

3. Analysis of recent research and publications. A well-known example of the implementation of tracking control issues on the basis of IOT is the control of the movement of diverse objects. These may be containers for sea transportation, vehicle

tracking, etc. For these purposes, trackers and sensors are typically used in a well-protected solid case and have a battery as a power source.

In the case of container transport, special equipment is usually used, which is created specifically for such needs. BlackBerry Radar from BlackBerry, which specializes in container tracking, can be considered as a representative of this class [2]. This is a device for tracking and container logistics. It is not large (292mm x 93mm x 42mm), it has a solid, well-protected mechanical damaged case, which has a number of sensors installed to monitor the condition of the container and objects that can be located and should be installed in the middle of the container. There are also universal solutions. As an example, you can consider the universal product ARUBA [3]. This product differs from the past only with its dimensions and is designed to be more for use within a single enterprise or production. Its main features are compactness, high reliability, low battery power consumption and a very long battery life of 36 months.

There are also products that are designed for logistics and are used for controlling the movement of vehicles such as: wagon carrying containers or tracking of urban transport. These include Atmel GPS Asset Tracking from Microchip. [4]

The main disadvantage of the above products can be considered that they carry out control of transportation by object, and in our case, control should be carried out by the subjects, that is, workers of the enterprise. Also, the disadvantages include the non-universality and dimensions. But it should be noted that these devices also have interesting advantages, for example - the ability to work in the city.

The next step was to focus on devices that can perform human-tracking. An example is Smart IoT People Tracking. [5] This development is very versatile and does not have the disadvantages described above. It allows you to perform quality control in many areas of human activity and use the technology of the internet of things to the fullest. But such an approach does not allow to solve all the questions and problems raised, namely the task setting for the workers of the enterprise.

After reviewing the solutions presented and a clearer understanding, attention was drawn to how other companies managed this. The best representative can be considered a whole stratum of modern enterprises such as Uber. They use, and for tracking, and for task statements - mobile smartphones. But their kind of activity is aimed at services in the field of taxi.

After fully understanding and analyzing the technologies that are being used and by which one can solve the problem, the following product was introduced: "Where are you?". [6] A versatile product that has both control and task functions.

Having studied this product in detail, attention was paid to some of the drawbacks and nuances. This product is secured to a specific area and will not be able to work except for it. Also, this product does not use independent development, and Navixy API, which in turn can cause some errors in the software. And most importantly, the product does not use the internet of things technology, which, in its turn, would help to carry out work more qualitatively and add many other useful features to the product in the future.

4. Uninvestigated parts of general matters defining. Thus, with regard to the existing means of control at enterprises, the traditional problem of the present can be considered as outdated traditional solutions. These tools are often autonomous and specific, they require a lot of expenses for their support and improvement according to the modern requirements of users. Modern world trends require the integration of a wide range of enterprises and production process control systems in the IOT to maximize the effect of their activities. Therefore, the research done in the article is relevant, modern and expedient.

5. Target setting. Not based on the review of existing solutions and analysis of the shortcomings of modern enterprise management systems, the following task has been put forward and fulfilled. Software for equipping the workers of the enterprise has been developed. Devices that perform the main task - these are smart phones workers. This solution was facilitated by the fact that the product should be widely used by personnel that is constantly changing. That is why there is no need to use specialized equipment, which in its turn is rather cumbersome, does not meet all the goals set. The task of each device is to recognize and establish the exact geolocation of the user in the city environment, in the shops of wholesale and retail trade. Unlike the existing tools, it is proposed to use algorithms that accurately identify a location with a low error, index user when they are next to each other and the ability to add other functions related to personnel management and task setting.

The main features and functionalities aimed at solving this task include the use of both GPS and GSM smartphone modules, which contributes to precise geolocation in a city environment that is used for commercial purposes, which in turn allows you to use logic and algorithms for other tasks, which can create a market. Also, the development provides a high saving of resources in technical terms. Saving resources is to develop only software, and use as a device - a smartphone user.

6. The statement of basic materials. Because it was chosen to use mobile phones to achieve the goal - product development is implemented in the Java programming language and has the look of the Android application. This allows you to use a wide range of technical features and capabilities of this operating system, and the technical resources of the devices themselves, such as built-in GSM and GPS modules in order to accurately determine the exact location of the user.

To achieve the user location goal, the Location-based service was used, which in turn uses the gsm technology to recognize and can use wi-fi for greater accuracy.

The solution to the problem is implemented on Android 8.1 (Oreo) because in my opinion - it is a sufficiently proven version of the operating system, which came out in 2017 and will be supported by the largest number of smartphones, which in turn will make the application as widely available and effective in distribution.

As mentioned above, the gsm module will be used to improve and accurately position my product in addition to gps. The algorithm of the work is that at first the program will use the GPS module of the device and in case when it will be impossible to do this - will use the GSM module. This algorithm is depicted in Fig. 1

The chosen operating system allowed adding to the product a useful functionality for setting tasks and having feedback from users. An example is the use of forms, chat, and easy communication with managers.

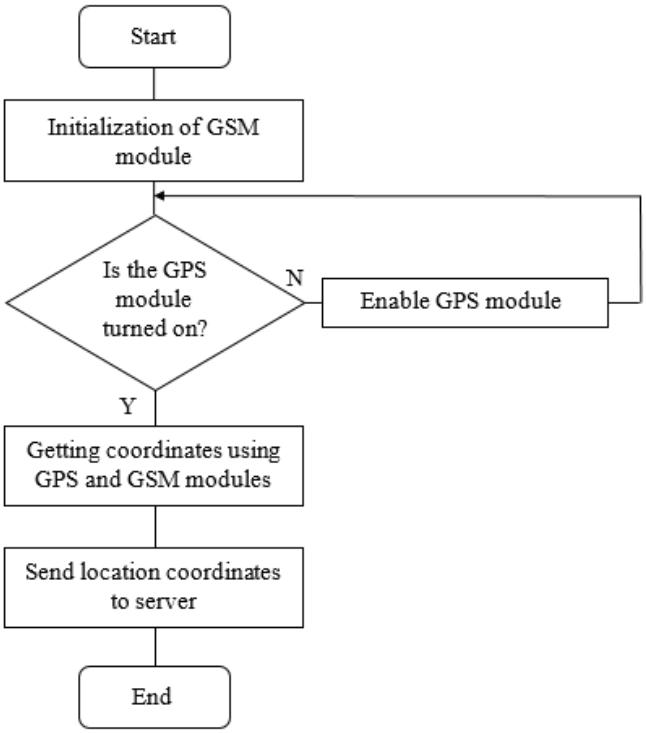

Fig. 1. Schematic representation of gps and gsm modules

There was also a permanent work with the server, from which the user can receive instructions and perform the tasks in real time. The instructions and tasks are created in a special form, which simplifies its sending from the server and makes the interface to the user more intuitive. At the same time, the implementation is executed in the opposite direction - the user has the opportunity to form and send to the server the result of their work in a convenient form. This allows the enterprise to get rid of unnecessary misunderstandings.

In this mode, a high employee benefit rate is monitored and monitored, and he is reminded that he must return to work if he leaves his place of work or moves away from that department or in other emergencies. And most importantly - with the help of using special forms in setting tasks it becomes possible to make the most of the resource that we provide the internet of things, which will make the work of the company more efficient.

7. Conclusions. The article was devoted to questions of improving the efficiency of production activities using technology internet of things, was tasked with the example of the chosen company - to implement this question. For this purpose, an overview of existing decisions was made, and the setting of specific objectives, goals and solutions to current problems in the world on the issue. Having obtained and analyzed the received information, it was specified and set the task of solving the problem of using mobile smartphones with the combination of technology internet of things.

References

1. AIN.UA (2017) Available at: https://ain.ua/special/what-is-iot/ (accessed 10.04.2019).

2. Asset Monitoring Devices Purpose-Built For Transportation (2018) Available at: https://www.blackberry.com/us/en/products/blackberry-radar/tracking-devices (accessed 12.04.2019).

3. Asset Tracking with Aruba Tags (2018) Available at: https://www.aruba-networks.com/products/location-services/aruba-tags/?source=sem&gclid=Cj0KCQjwsZHPBRClARIsAC-VMPDuRxZkSJRDq6gfOnzzV5jp4N_1e9NZGbih-Uqhp4f5xx6QE5MN-fQaAv6OEALw_wcB (accessed 12.04.2019).

4. Smart Connected Secure (2018) Available at: https://www.microchip.com/ /design-centers/internet-of-things (accessed 15.04.2019).

5. Smart IoT People Tracking (2018)– Available at: http://www.hitssolutions.com/smart-iot-worker-location-tracker/ accessed 20.04.2019).

6. GPS-трекер for Android (2018) Available at: https://www.gdemoi.ru /app/tracker/android/ (accessed 20.04.2019).

Autors

Petrov Victor – master student, Department of Computer Engineering, National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”.

E-mail: thevityun@gmail.com

Петров Віктор – магістр, кафедра обчислювальної техніки, Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського».

Klymenko Iryna – associate professor, Department of Computer Engineering, National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”.

E-mail: ikliryna@gmail.com

Клименко Ірина – доцент, кафедра обчислювальної техніки, Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського».

Verba Oleksandr – associate professor, Department of Computer Engineering, National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”.

E-mail: olverba@gmail.com

Верба Олександр – доцент, кафедра обчислювальної техніки, Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського».

EXTENDED ANNOTATION

Petrov Victor,
Klymenko Iryna, Verba Oleksandr

METHOD TO IMPROVE EFFICIENCY OF MANUFACTURING ACTIVITY BY INTERNET OF THINGS TECHNOLOGY

Relevance of research topic. In recent years, popularity in various spheres of human activity is gaining such a notion as the Internet of Things (IOT). This technology allows you to display different devices in an open network so that they can interact with each other. IoT is also the ability to connect devices without human intervention, and most importantly - a large amount of data that generates and collects devices, which can then be analyzed in order to be used in future for various needs, for example - increasing the comfort and business decision making.

Formulation of the problem. Absence of cheap tools for improving the efficiency of production activities of employees using technology Internet of Things.

Analysis of recent research and publications. A well-known example of the use of IOT technology for improving efficiency is the special equipment used in tracking, for example, marine containers. Also, the technology is used for tracking diverse transport or small-sized cargoes between enterprises. But this technology is not used to track people - employees of enterprises.

Setting objectives. Since the market is to some extent not using the technology of the IOT in improving the efficiency of production activities of employees, and after analyzing existing similar solutions, it was decided to create a mobile application by which the worker's work statistics are collected, his tracking is going to be. The statistics are transmitted to the server where the analysis is carried out and the conclusions are executed.

Presentation of the main material. Created application for use on mobile smartphones of enterprise workers for collecting information about their location and transferring this information for analysis on the server. This approach uses the logic of the IOT and allows using the information obtained to improve the efficiency of production activities.

Conclusions. A new approach was developed to use the IOT technology in a trekking process for the employees of the company using their mobile phones. This approach has allowed to improve production efficiency more than 2 times.

Keywords: Internet of Things, GPS, control, increase of efficiency