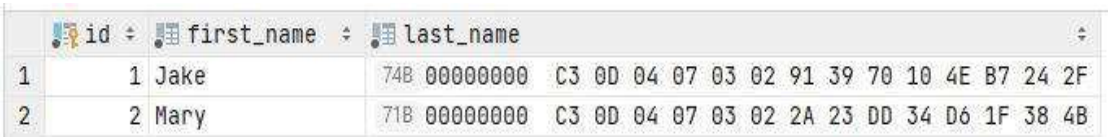
example, an attempt to steal a user's session. A way to protect against this attack is to use libraries to clean up untrusted HTML code [3].

Figure 3 – JavaScript code in the URL bar

Figure 4 – Successful reflected XSS attack

The last thing is the problem of storing data securely in the database. If the data is not encrypted, anyone who has access to the database can view confidential data. To make such action difficult, the PostgreSQL database will be used and its *pgp_sym_decrypt()* and *pgp_sym_encrypt()* functions to encrypt sensitive customer data [4]. It is worth noting that the database and the store's application must be run on two different servers. An example of encryption of the last name attribute can be seen in Figure 5 – The encrypted last_name attribute in PostgreSQL.



	id	first_name	last_name
1	1	Jake	74B 00000000 C3 0D 04 07 03 02 91 39 70 10 4E B7 24 2F
2	2	Mary	71B 00000000 C3 0D 04 07 03 02 2A 23 DD 34 D6 1F 38 4B

Figure 5 – The encrypted last_name attribute in PostgreSQL

REFERENCES

1. Ochrona informacji w sieciach komputerowych / pod red. prof. P. Urbanowicza. – Lublin: Wydawnictwo KUL, 2004. – 150 s.

2. Urbanowicz, P. Bezpieczenstwo w cyberprzestrzeni a prawo karne / P. Urbanowicz, M. Smarzewski // Ksiega pomiatkowa pomiatkowa ku czci Księdza Profesora Andrzeja Szostka MIC, Lublin: KUL. – 2016. – P. 479-488.

3. Bezpieczeństwo aplikacji webowych/ M. Bentkowski [at al.]. – Kraków: Securitum Szkolenia, 2019.

4. How to encrypt and decrypt data with Hibernate. [Electronic resource]. – Access mode: https://vladmihalcea.com/how-to-encrypt-and-decrypt-data-with-hibernate. – Access date: 23.01.2021.

УДК [004.56+003.26] (075.8)

Stud. Justyna Winiarczyk
Supervisor prof. P. Urbanovich
(the John Paul II Catholic University of Lublin, Poland)

APPLICATION OF ROBOTS IN MEDICINE AND HEALTHCARE

Robotics is a field which joins areas such as science, engineering and computer science. The development of this scientific field has been going on for several decades, but only recently it became much more rapid. The main objective of robotics is the construction of intelligent machines, which fill find use in various areas and offer a wide range of benefits. Medical sciences and healthcare are consistently trying to use newest technologies, which increase effectiveness of treatment and therapies. Numerous studies and research led to creation of medical robots.

Medical robots are devices constructed in a way that allows them to support healthcare during diagnostic actions, as well as performing medical procedures and operations with different degrees of difficulty.

Robots consist of the following elements [1]:

- sensors, which enable mechanisms to detect the edges of items, recognizing shapes, size and color of objects. Furthermore, sensors allow to control temperature and sound,
- actuator, which enable movement of the robot,
- power supply, which bring energy to the robot,
- pneumatic muscles, which are responsible for managing the pressure,
- engine, which allows the robot to rotate,
- controller, which controls every movement.

The most common medical fields which use robots are surgery, cardiology and neurology. Surgical robots and rehabilitation robots, among others, are examples of medical robots. Surgical robots support doctors with performing complicated medical operations, which require extremely precise movements and huge elasticity. The most commonly used mechanism is a robot with arms with attached tools required to complete an operation. Another component of the robot is a camera, which provides high quality feed from the operated location. During that time, surgeons do not have to be standing next to the patient, which improves work comfort and enables to perform long operations [2].

Rehabilitation robots support the lives of people with physical limitations. They are usually used for diagnostics and rehabilitation, and can be used by professional therapists. Robots guarantee precision of routine exercises, which is a key to achieving best results in shortest possible time. The most advanced robot is a supported exoskeleton, which is a mechanism attached to a body, which increases mobility. Exoskeletons support people who are unable to move on their own (pic. 3) [3]. Development of robotics has great potential in medicine. Thanks to tremendous progress of technol-

ogy and robotics, it is possible to create innovative mechanisms, which will expand the capabilities of healthcare.

Usage of robots enables to perform operations, which require great precision.

Picture 1 – Da Vinci Robot [3]

The main benefits of using robots in healthcare are decreased risk of human error and relief of doctors and therapists. An undoubted disadvantage is the cost of robots, but all the benefits pay off the high price.

A key role for the adequate use of robots has a solution of various aspects of the problem of information security [4].

REFERENCES

1. Components of Robot, URL: https://www.javatpoint. com/ components-of-robot, access: 30.03.2021.

2. RoboticSurgery, URL: https://www.mayoclinic.org/tests-procedures/robotic-surgery/about/pac-20394974, access: 30.03.2021.

3. URL: https://www.researchgate.net/profile/Eduardo-Bastos-7/publication/281377370/figure/fig1/AS:284454921752581@1444830746635/Da-Vinci-robotic-systems-have-three-major-components-the-surgeon-console-the-surgical.png, access: 30.03.2021.

4. Ochrona informacji w sieciach komputerowych / pod red. prof. P. Urbanowicza. – Lublin: Wydawnictwo KUL, 2004. – 150 p.