The Importance of Medical Images in Medicine

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ANNOTATION

The place of medical images in medicine is of great importance. The accuracy of the medical images and the high quality of the descriptions are very important for the treating physician in the thematic diagnosis of the patient. Processing, storage, reshaping, converting medical images from analog to digital form. Keywords: Medical images, analog form, digital form, pixel, matrix form, their main advantages in the transition to the system, the accuracy of images and high quality.

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Introduction

In medicine, physicians primarily use medical images to accurately diagnose and treat patients.

Medical imaging is the creation of visual images of the internal structures of the body for clinical analysis and medical intervention, as well as some others. Medical imaging allows you to visualize the process and process of visualization of internal structures hidden by skin and bones, functions of organs or tissues, as well as diagnose diseases.

They are also called diagnostic images. Methods for obtaining medical images include methods of radiation diagnostics - X-ray, magnetic resonance, radionuclide and ultrasound. Medical images can be divided into two groups: digital and analog. Analog images are images that contain continuous data. Like all analog imaging, medical imaging has its drawbacks. Analog medical images are more blurry and thematic than digital ones. Doctors need more accurate and clear medical images. This is due to the high level of prevention of errors by doctors in making a diagnosis. Analog images are images containing continuous data. These images are provided to the doctor to diagnose the disease. All analog images, including medical images, have flaws. In particular, they are difficult to store, process diagnostically, and transfer from computer to computer. In analog form, images have a lot of unnecessary signals, as well as noise that degrades their quality. These defects do not show up in digital images. They are based on a cellular structure (matrix) obtained from the signals of diagnostic devices and containing information about body parts (in a compact form).

Let's briefly describe the devices that work with the above images.

Radiography. There are two forms of X-ray imaging used in healthcare facilities – radiography and fluoroscopy. Despite the development of 3D tomography, this 2D technique is still widely used today due to its low cost, high accuracy, and low radiation doses. This imaging engine uses a wide spectrum of X-rays to create an image and is the first imaging technique used in modern medicine.

Magnetic resonance imaging. Magnetic resonance imaging uses powerful magnets to observe the hydrogen nuclei (i.e., protons) of water molecules in human tissues, which creates a spatially encoded, identifiable signal, resulting in images of the body. The MRI machine emits a radio frequency (RF) pulse at the resonant frequency of the hydrogen atoms in water molecules. Radio frequency antennas send pulses to areas of the body where they are recorded. The RF pulse is excited by protons, as a result of which their direction changes relative to the main magnetic field. When the RF pulse is released, the protons "relax" and re-align with the main magnet, emitting radio waves in the process.

An image of the radio emission of hydrogen atoms in water has been discovered and reconstructed. The resonant frequency of a rotating magnetic field is called the Larmor frequency and is determined by the chemical environment of the cores of the main magnetic field.

Ultrasound. Ultrasound uses high frequency sound waves reflected in tissues in various ways to create an image. It is commonly used to describe the fetus in pregnant women, but ultrasound is used much more widely. Other important applications include imaging of the abdomen, heart, chest, muscles, tendons, arteries, and veins.

Ultrasound may provide less anatomical detail than methods such as CT or MRI, but it has a number of advantages that make it more convenient in many cases, such as being able to show the movement of a structure in real time without emitting ionizing rays. radiation). Ultrasound is also being used as a research tool for tissue characterization and the introduction of new tissue imaging techniques. Ultrasound differs from other medical imaging modalities in that it is a high-frequency sound signal that is sent to tissues, depending on the composition of different tissues, the signal is attenuated and returned at different intervals. Ultrasound scanners can be adapted for critically ill patients in intensive care units without patient mobilization. a moving image can be obtained in real time and can be used to guide the drainage and biopsy processes. Modern scanners show mountain stream in arteries and veins.

Elastography is a relatively new imaging technique that shows the elastic properties of soft tissues. This method has been invented for twenty years. Elastography is useful in medical diagnosis because elasticity can distinguish between healthy and unhealthy tissues for certain organs. For example, cancer is often more serious than the surrounding tissue, and a diseased liver is much larger than a healthy liver. There are several medical techniques based on the use of ultrasound, magnetic resonance imaging and tactile tomography. Ultrasound elastography is a widely used clinical technology and we are seeing its adoption in clinical ultrasound devices. The continuous growth in elastography activity over the past decade has demonstrated the successful application of the technology in various areas of medical diagnosis and treatment monitoring.

Tactile imaging is a method of digitizing medical images. The tactile image is a function of R(x, u, z), where R is the pressure on the soft tissues of the surface when the deformation is applied. The tactile imaging is similar to guided palpation because the device on which the set of pressure transducers is mounted works like a human finger, slightly deforming the soft tissues. This procedure is used to create the reproductive structures of the prostate, breast, vagina, and pelvic organs, as well as muscle trigger points.

Thermography - mainly used to describe the mammary glands. There are three approaches: telethermography, contact thermography, and dynamic angiothermography. These digital infrared imaging thermographic techniques are based on the principle that metabolic activity and circulation in precancerous tissues and in the area around breast cancer is almost always higher than in normal breast tissue. Malignant tumors require more and more nutrients, and therefore increase the supply of minerals to cells through existing blood vessels, as well as due to the opening and formation of new "fixed" vessels (the theory of neoangiogenesis).

Proponents of telethermography and contact thermography claim that this process raises the regional surface temperature of the chest, but there is very little evidence that thermography is a topical means of detecting breast tumors. Telethermography is based on the conversion of infrared radiation from the human body into an electrical signal that is displayed on the screen of a thermometer. Cholesterol contact thermography is based on the optical properties of liquid cholesterol crystals, which show up as a color change to iridescent colors when applied to heat-radiating surfaces.

The coldest places are red, the coldest. In 1860, Gustav Kirchhoff, one of the first researchers of thermal radiation, managed to prove that the ratio of radiation and absorption of a body does not depend on its nature, but is a uniform (universal) function of frequency for all bodies.

Echocardiography. When ultrasound is used to visualize the heart, the process is called echocardiography. Echocardiography allows you to see the detailed structures of the heart, including the size of the chamber, how the heart works, its valves, and the pericardium (pericardium around the heart). Echocardiography uses 2D, 3D, and Doppler imaging to create images of the heart and observe deposits flowing through each of the heart's three valves. Echocardiography is widely used in a variety of patient populations, from patients experiencing symptoms such as shortness of breath or chest pain to those being treated for cancer. Unlike other imaging modalities, transthoracic ultrasound is safe for patients of all ages, from infants to the elderly, with no side effects or radiation exposure. Echocardiography is one of the most widely used imaging modalities in the world due to its portability and versatility. In an emergency, echocardiography can be performed quickly, easily, and near a hospital bed, which is convenient for many physicians.

With the help of computer devices, images of body parts are created from the signals stored in the matrix using complex algorithms. Digital images are characterized by high quality, sharpness and clarity of the image, the absence of any defects in signal transmission. Images are easy to store on various magnetic, optical and magneto-optical digital transmitters, easy to process on a computer and transmit over long distances over telecommunication networks, the quality and appearance of the image do not change. When converting digital images into a matrix system, their main advantages are sharpness and high image quality. However, these images can easily be stored on the computer devices where they are to be stored, and other processes can be performed on the images. In addition to the medical devices described above, there is the term nuclear medicine diagnostics. Nuclear medicine includes both diagnostic imaging and treatment of diseases, and can be called molecular medicine. Nuclear medicine uses the known properties of isotopes and particles emitted by radioactive substances to diagnose and treat various pathologies. This functional approach to medical examination is used in many fields such as oncology, neurology and cardiology. Unlike the conventional concept of radiology, nuclear medicine allows for the assessment of physiology. For testing, a short-range isotope, such as **99m Tc AOK**, is administered to the patient. These isotopes are mainly activated by biologically active tissues and can be used to detect tumors or bone fractures. Images are obtained when collimated photons are detected by the crystal, which emits a light signal, which in turn is converted into data for calculations.

ANALYSIS AND METHODOLOGY OF THE LITERATURE

No matter how many generations of medical scanners there are today, the function of all of them is to digitize analog images. The advice given to physicians today is to use technology that prepares images with the highest precision. Medical images are divided into three types: vector, raster and matrix. Vector images consist of elementary lines. The image data has vector properties and we can change them as needed without losing quality. Digital images are formed from such a set of dots of different colors. The main difference between a vector and a bitmap is that a bitmap creates a look that is much closer to a real image than a vector image. A bitmap image is made up of very small elements called pixels. Raster graphics work with hundreds and thousands of pixels that form an image. The advantage of raster graphics: if the pixel size is small, then the quality of the image will be close to the photo. The computer easily controls external devices that use dots to display individual pixels. Therefore, raster images are easily printed on printers. Matrix images are made up of a large number of cells, which we call pixels. The higher the resolution, the higher the image quality. Working with such images, we are faced with their compression or elongation (deformation). By changing their size. Such cases are observed in the process of printing images in the field of fluorography, tomography and radiology. In image processing processes, we can convert matrix images to vector images. Each element in matrix images occupies a certain place in memory. In medical diagnostics, the display screen area is represented as a matrix as follows: 64x64, 128x128, 256x256, 512x512, 1024x1024, 2048x2048 and 4096x4096 pixels. The larger the matrix, the better the quality. As the quality increases, so does the capacity of the address stored in memory. Therefore, a high level of matrix volume is selected and the quality indicator is maintained.

DISCUSSION

Various medical images, no matter how they are viewed, can combine X-ray, ultrasound, radionuclides or magnetic resonance into two main groups: analog and digital. The images are first created as analog, then digitized as they are transmitted from the detector to the display.

Analog Images:

- traditional film radiography, including linear tomography;
- conventional fluoroscopy,
- sonography (ultrasound waves, diagnostic medical examination to remove structures from the body and create an image). This test is often referred to simply as an ultrasound or sonography. Analog-to-digital images:
- digital radiography (secondary digitization of radiography), digital fluoroscopy, • digital animated angiography,
- sonography,
- scintigraphy (use of internal radionuclides to create two-dimensional images) Digital imaging:
- primary digital methods of radiography;
- CT scan,
- Magnetic resonance imaging,
- emission tomography (one- and two-photon),
- Doppler mapping.

The appearance of diagnostic images on the monitor can be of two types. A vector consists of a set of elementary lines and curves represented by mathematical formulas in the form of mathematical objects called images. The latter has a graphic function and can be changed without compromising image quality in accordance with the programs chosen by the doctor.

CONCLUSION

In this article, we can see the importance of the role of medical images in medicine, where they can be used as a guide for physicians in making accurate diagnoses for patients. We can also see that patients all over the world become disabled or die due to the mistake of doctors. Image accuracy and high image quality for diagnosis ensures that the attending physician does not make mistakes. First of all, we are sure that all medical technologies will be modern, all medical specialists will be highly qualified, and there will be no mistakes in diagnosing patients. Due to the sharpness of the image, we can clearly see the site of the lesion, for example, on computed tomography of a tumor in the patient's brain, we can express its size, diameter, depth in centimeters, in traumatology, the quality of the images is guaranteed by the doctor. In conclusion, we emphasize that if any of our medical images are clear, crisp and of good quality, our doctors will have no difficulty in diagnosing patients.

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