

INTERNATIONAL CONFERENCE
St Petersburg, RUSSIA
04 March 2020



«Metrological Support of Innovative Technologies» ICMSIT-2020

««Digital Twin» Technology in Medical Information Systems»

O E Bezborodova, O N Bodin, A I Gerasimov, M N Kramm,
R F Rahmatullov and A G Ubiennykh



ICMSIT-2020
Metrological Support
of Innovative Technologies

Problem statement

Given the high mortality rate from cardiovascular diseases and the need to transfer medicine to a more high-tech level of development, the authors propose the use of digital twin technology for the diagnosis and treatment of heart diseases. As a digital twin of the human heart, it is proposed to use the combination of an equivalent electric heart generator and the of D. Noble computer heart model within the subsystem for supporting medical decision-making. The use of such digital twin will make it possible to reliably conduct non-invasive cardiodiagnosis to select drugs within the treatment regimen.

Solution methods

The authors propose the use of the digital twin (DT) technology⁰³ in medical decision-making support subsystems (MDMSS), as part of medical information systems (MIS). The structure of MIS of a medical institution is given in figure 1. MDMSS is given in figure 2.

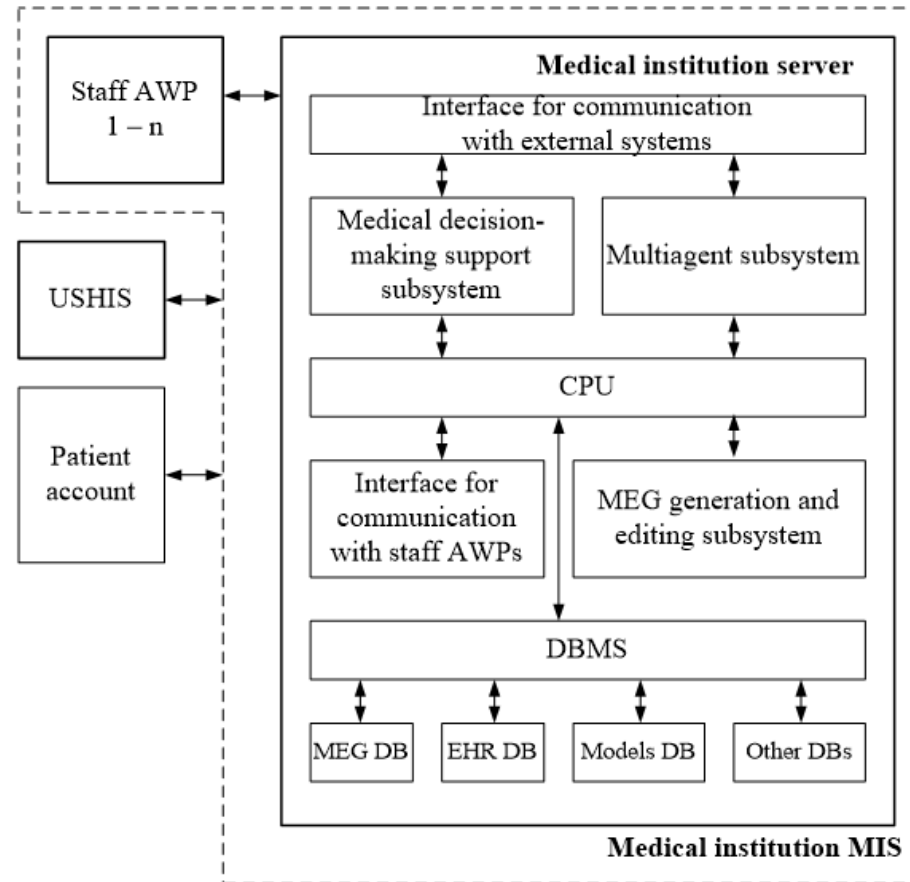


figure 1

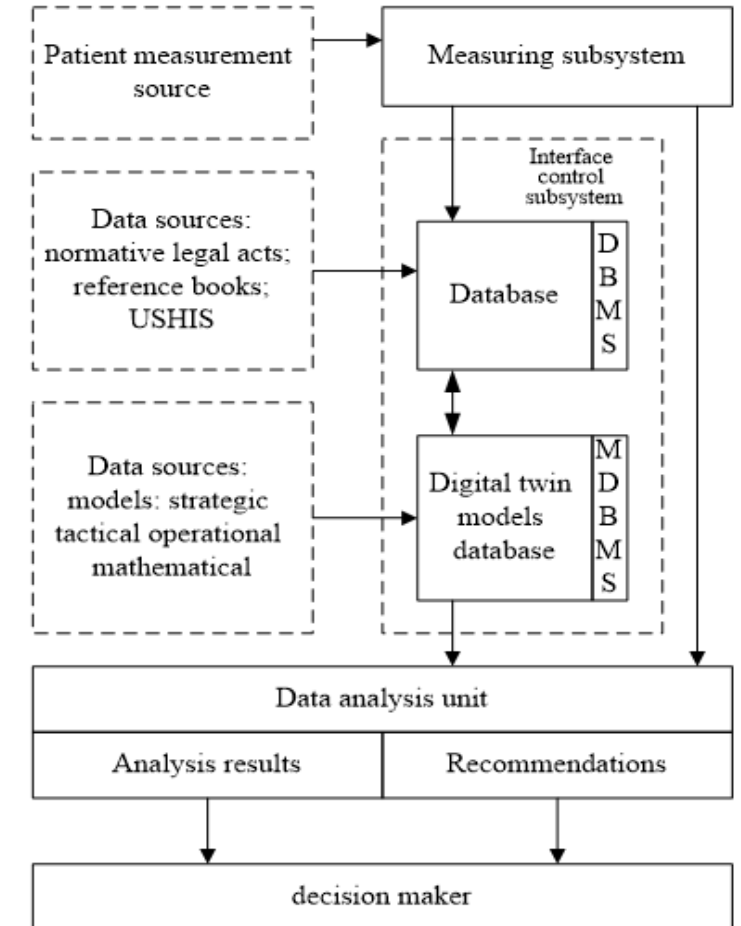


figure 2

Results, implementation

Implementation of the DT direction in medicine will allow solving direct and reverse problems of CVD diagnosis, which consists in conducting CVD studies of the patient, implementing diagnostic measures based on the human heart's EEGH – DT, establishing a diagnosis and, using DT (figure 3). Noble's CMH, modeling the results of the treatment process in order to select a personalized treatment regimen containing medical procedures, medications, diet, and physical activity. The method proposed by the authors is shown in figure 4.

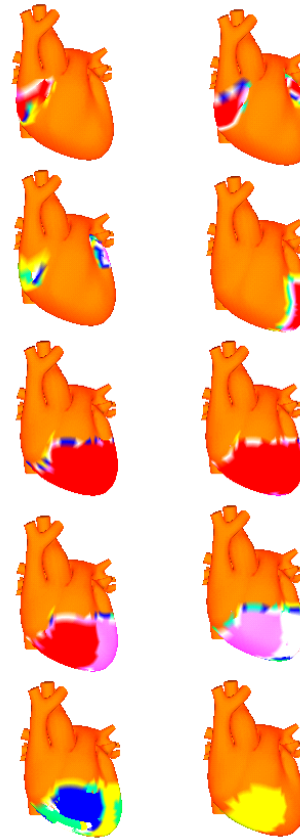


figure 3

Conclusions

The combination of D. Noble EEGH and CMH within the framework of MDMSS will allow for non-invasive diagnosis of CVD, selecting the names and dosage of drugs using DT, rather than a real patient, which eliminates side effects and worsening of the patient's state. And thus, it takes healthcare to a new level of high-tech medical care.

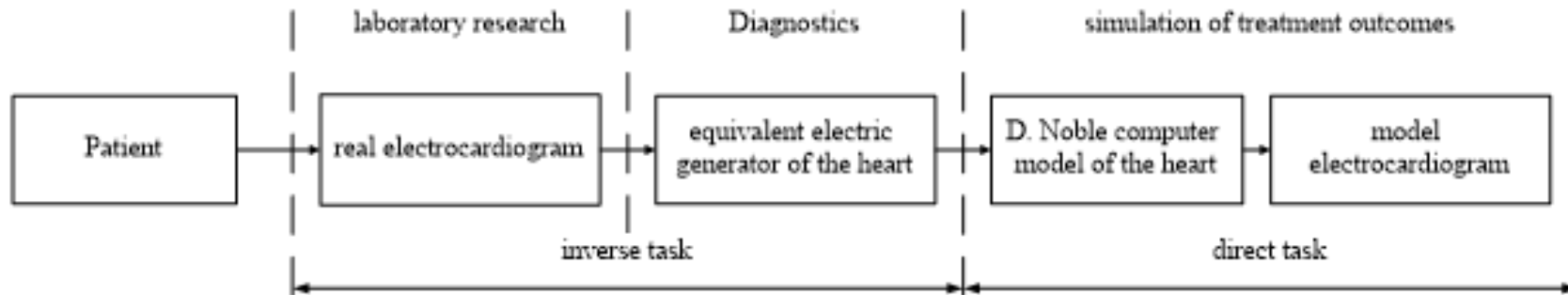


figure 4

Contacts

O E Bezbrodova

Penza state University, 40, Krasnaya str., Penza, 440026, Russia

E-mail: 2oxana243@yandex.ru

INTERNATIONAL CONFERENCE
St Petersburg, RUSSIA
04 March 2020

**«Metrological Support of Innovative Technologies»
ICMSIT-2020**