Medical Research Based on Computer Engineering: Neural Networks, Sensors and Artificial Chemical Defense Devices

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Abstract. The research group designed an algorithm based on artificial neural network. The algorithm can identify the survival prediction rate of survivors in nuclear disaster area, and use these data to support the work of chemical defense forces. At the same time, the mathematical calculation model and sensor monitoring and data return model are designed for possible nuclear pollution. The two computer models can compare data with each other to reduce errors. The research group also tried to propose a training method for chemical defense forces' rescue mission based on neuroscience and virtual reality technology. The research group analyzed and reported the above computer engineering models and sociological experiments. The artificial neural network is used to predict the damage caused by nuclear radiation dose to human body. The method is as follows. We predicted the radiation department staff in medical units and whether they had cancer. The implementation of this neural network not only verified the radiation damage, but also provided a new idea for clinical engineering. At the same time, the research team also evaluated the effectiveness of the neural network.

Keywords: Nuclear radiation, chemical protection, emergency rescue, neural network, computer engineering, intelligent teaching.

1. Background

Nuclear reaction refers to the process in which an incident particle collides with an atomic nucleus to change the state of the atomic nucleus or form a new nucleus. The energy, momentum, angular momentum, mass, charge and parity before and after the reaction must be conserved. Nuclear reaction is an extremely important natural phenomenon that has already existed widely in the universe. The existing chemical elements, except hydrogen, are all synthesized through natural nuclear reactions. Nuclear reactions on stars are the fundamental source of huge energy radiated by stars. However, nuclear energy will also have an impact on human beings at present. To some extent, if unstable factors occur in nuclear power plants and other regions, the damaged nuclear power plants will have an impact on former human beings, including gene mutation and disease, Therefore, the research team has designed a model for the current nuclear energy situation in order to solve the problem of chemical protection after nuclear energy leakage. [1-6]

2. Model design

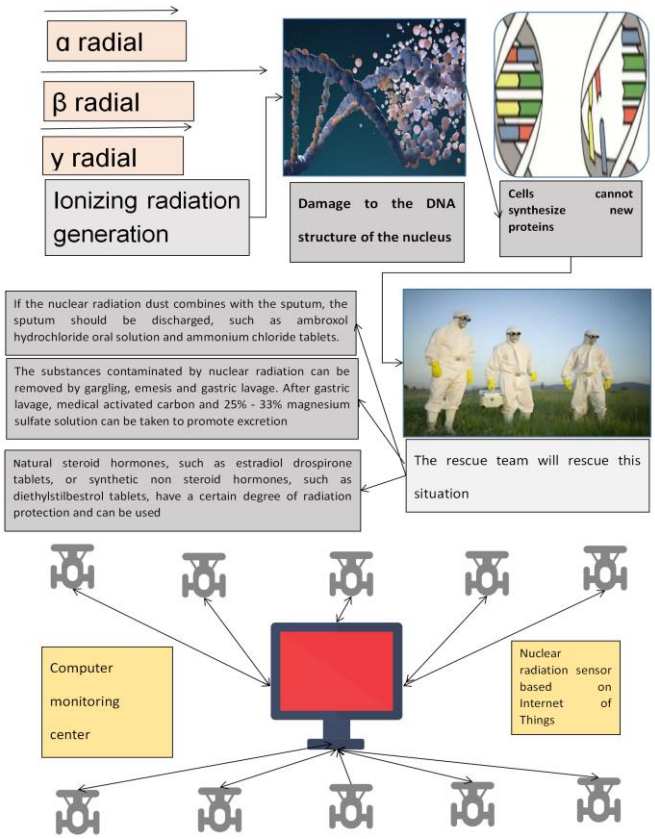


Figure 1. Mechanism diagram based on the impact of nuclear radiation on human body

Based on the computer response mechanism to the impact of nuclear radiation, the main reason is that and radiation can destroy the DNA bimolecular structure of the human body and the environmental stability of the human body. The main medical mechanism is that when the DNA structure is destroyed, the starting point of cytogenetics disappears, the molecular signals between cells have no source at all, and the ribosomes in the molecules have no genetic information support. When the radiation measurement destroys the internal structure of cells, it will cause the human body to weaken and even die. Three kinds of radiation in nuclear radiation will have an impact on the human body. The second kind of radiation in the figure is the main active substance. Therefore, it is necessary for the chemical prevention team to install physical sensors in the nuclear radiation affected area, in order to solve the problem of data sources in the nuclear radiation affected area and complete the first step of environmental monitoring.

As shown in Figure 2, according to the mathematical formula and calculation test results that have been developed by the current research team, the research team has carried out the research on the modeling strategy of this visual environment monitoring system. We try to establish a coordinate system. Of course, this coordinate system has two coordinate axes during the estimation of the impact area, because it is not necessary to estimate the height of the impact of the radiation area. In this visual model, based on the situation of the affected area of the nuclear crisis after the outbreak, it is necessary to visualize the four core areas shown in the figure, and provide the data analysis results to the chemical defense forces, which will rescue different areas with different emergency medical strategies.

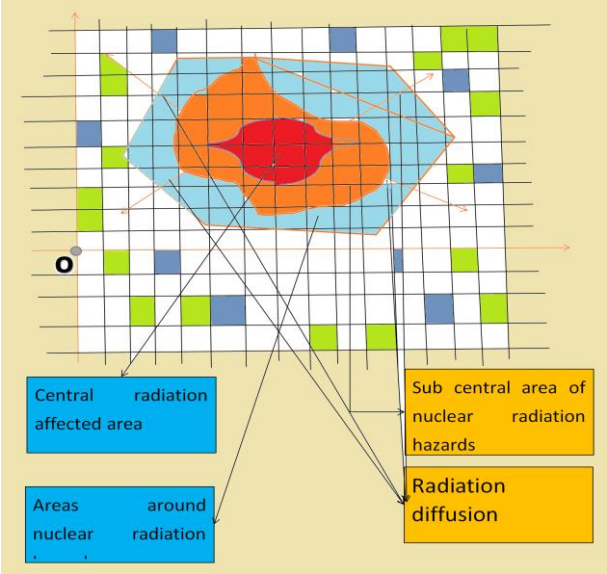


Figure 2. Visual monitoring system using coordinate system and mathematical calculation method

As shown in Figure 3, the research team described the formula to be used in Figure 2, and described the usage of each formula and the meaning of each letter. Through the three formulas shown in the figure, the theoretical nuclear radiation coverage without the influence of wind can be calculated mathematically, or the overall radiation coverage under the effect of wind can be calculated mathematically.

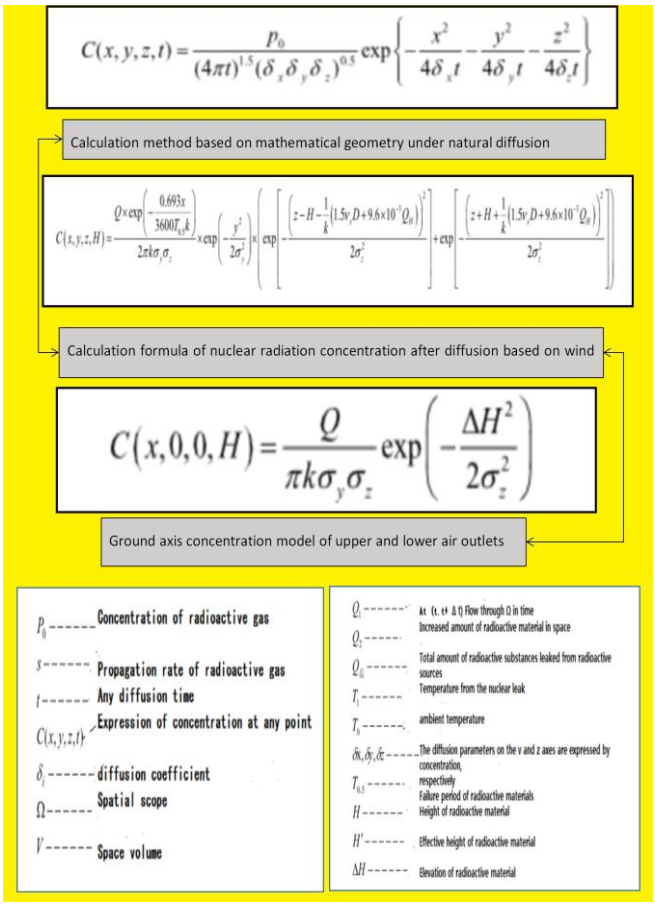


Figure 3. Calculation Formula Expression and Mathematical Support Principle Based on Nuclear Radiation Affected Areas

When nuclear radiation occurs, the computer system runs using mathematical methods to estimate the scope of the affected area. The main reason is that at this stage, only mathematics and remote

sensing science can support the chemical defense forces, but remote sensing cannot monitor small nuclear radiation. Therefore, it is necessary to use mathematics to support rescue at the first stage.

As shown in Figure 4, when the data on the impact of nuclear radiation are obtained, the chemical defense forces enter the areas affected by nuclear radiation and carry out different rescue strategies for different populations. However, in the rescue teams of various countries, it is difficult to organize doctors and soldiers to send them to the areas to be rescued together. In order to search and rescue people in the whole area, we need to rely on our designed procedure, which can determine the survival rate according to the human condition. This neural network can support the troops to carry out priority operations for the best possible survivors.

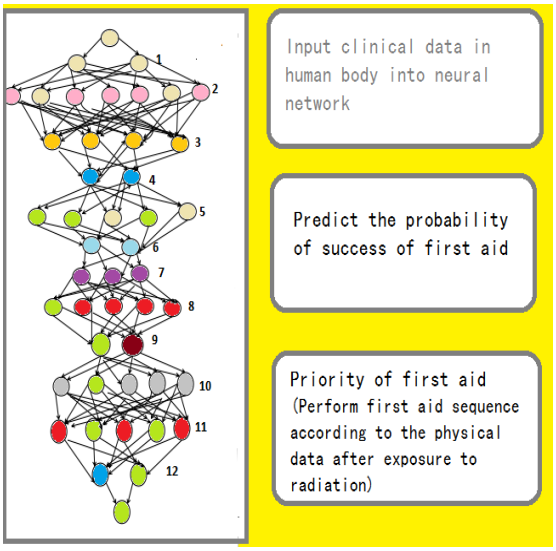


Figure 4. Survival rate based on artificial neural network

This neural network will rest deeply based on the data of heart rate, pulse, regional radiation, age, sex, height, weight, basic disease, BMI, blood type, nervous system score and the number of abnormal blood routine indicators input by the rescue force, and try to provide rescue success rate for each person in need of rescue, and guide the work of the rescue force according to this success rate.

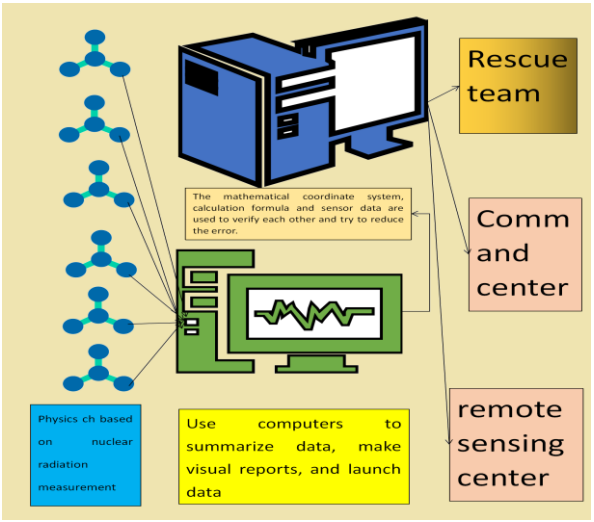


Figure 5. Combination model of accurate data value and remote sensing using physical sensors

As shown in Figure 5, the research team believes that chemical defense forces need to install nuclear radiation sensors in areas affected by nuclear radiation, which can be mutually corrected with mathematical calculation methods, and optimize the overall computer functional engineering model through the latest data. In addition, remote sensing technology can also be integrated into the overall nuclear radiation detection. In the overall nuclear radiation detection process, according to the relevant data output, data exchange can be conducted for rescue forces, command centers and remote sensing

data centers to achieve accurate results. In Figure 1 to Figure 5, the research group designed an overall model of nuclear radiation rescue, and built a biomedical injury reversal - precise positioning of priority groups - impact estimation under mathematical modeling - accurate working mechanism of data under the optimization of nuclear radiation sensors and research and development ideas of auxiliary equipment for chemical defense forces.

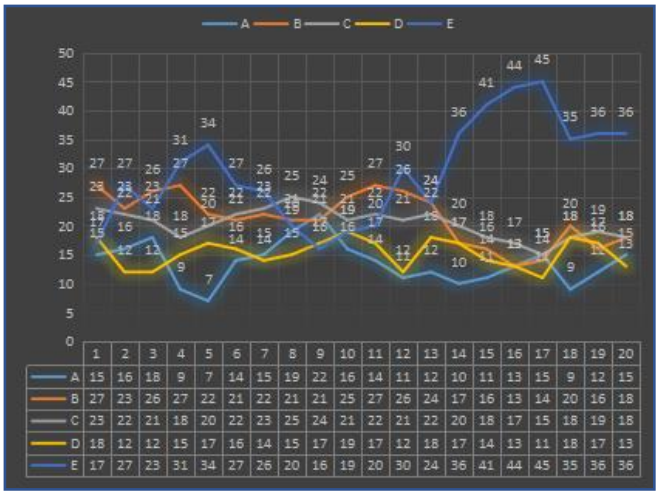
The research team sorted out the working principle, and achieved preliminary modeling and proposed engineering concepts in terms of cutting-edge technologies.

3. Experiment and data analysis

Design experiment.

Objective: To understand the current situation of neuroscience teaching in China and Belarus, and to understand whether there are relevant teaching models and students' level. Participants: Master and undergraduate students of Sakharov International National Institute of Ecology of the Republic of Belarus, clinical medical expert students of Belarusian National Medical University, Chinese students of Moscow University, students of the Ninth Clinical Medical School of Peking University of China, and Chinese students from universities in Kiev, Ukraine. Topics 1-5 mainly focus on the impact of nuclear radiation on human body, 6-10 mainly focus on the understanding of nuclear radiation emergency strategies, 11-15 mainly focus on the self rescue strategies after the crisis caused by nuclear power plants, and 16-20 use mathematics to assist equipment development.

Data analysis: As shown in Figure 6, during the whole experiment process, the model has certain feasibility and demand in promotion. People living or working in the region have a certain understanding of nuclear energy issues, perhaps related to the international situation.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	15	16	18	9	7	14	15	19	22	16	14	11	12	10	11	13	15	9	12	15
B	27	23	26	27	22	21	22	21	21	25	27	26	24	17	16	13	14	20	16	18
C	23	22	21	18	20	22	23	25	24	21	22	21	22	20	18	17	15	18	19	18
D	18	12	12	15	17	16	14	15	17	19	17	12	18	17	14	13	11	18	17	13
E	17	27	23	31	34	27	26	20	16	19	20	30	24	36	41	44	45	35	36	36

Figure 6. Data-analysis

A neural network was designed to collect information from 22 retired doctors in the radiation Department of Chifeng tumor hospital. The daily workload, working years, working time/day, and daily radiation were estimated. At present, statistics have been made on existing diseases (including whether early cancer is diagnosed or not), the parameters of the neural network are as follows, and the number of iterations (epoch): 550, Batch size (0 means no batch) 4, Learning rate: 0.01, Percentage of test set (%): 15, Validation set percentage (%): 15, Loss function: meansquareerror, Optimizer: Adam

(1) Final training set loss: 0.0895, accuracy: 0.8125;

(2) Loss of final verification set: 0.3167, accuracy: 0.3333;

(3) Test set loss: 0.1714; Accuracy: 0.6667;

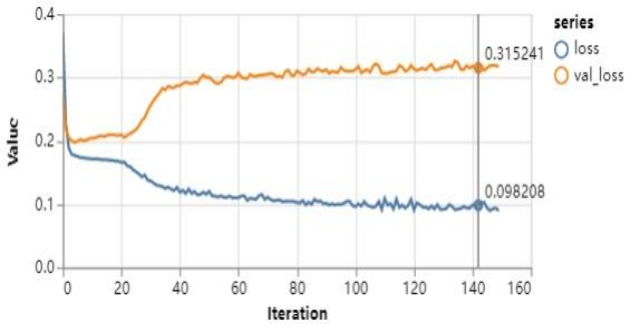


Figure 7. loss function

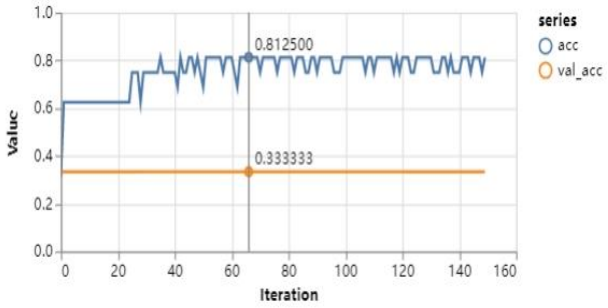


Figure 8. Accuracy of predicted value

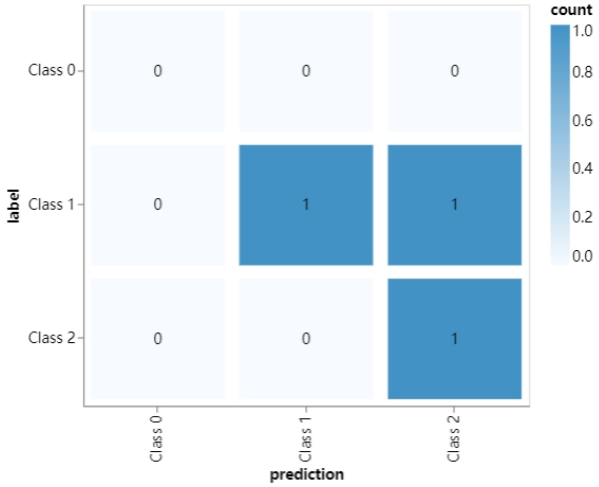


Figure 9. Confusion matrix

The research team believes that although the accuracy rate of the current neural network test set is only 33%, this may be related to the relatively small sample size, but it can also prove that there is a mathematical calculation method for radiation on cancer. The research team believes that the accuracy rate of the neural network can be improved by investigating more units in the future.

4. Discussion

We try to integrate virtual reality technology to simulate the emergency scene after nuclear radiation from the stimulation of neural senses, and try to apply this computer teaching model to the exercise of chemical defense forces. This model can be used to simulate the formal situation in the area affected by nuclear radiation, and make the chemical defense forces more skilled in their work and provide the success rate of rescue. In economics, this teaching product can also stimulate consumption and produce relevant economic benefits.

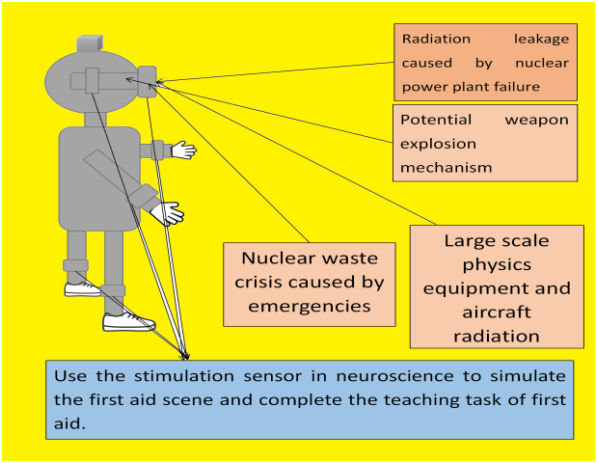


Figure 10. Teaching strategy model of virtual VR technology

5. Conclusion

The research team has built an overall auxiliary equipment and training strategy model for chemical defense forces, which has solved the strategy problem of first aid for people in areas affected by nuclear radiation, as well as the problem of data collection for radiation itself, and has a good popularization. It is also beneficial to the whole human race in economics.

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