Master thesis:

Information Subsystem for Pathfinding in Crowd Simulation in a Confined Space

ABSTRACT

Master thesis: 78 pp., 16 pictures, 8 tables, 1 application, 22 references.

Topicality. With the development of globalization and the rapid growth of the planet's population, the question of studying the laws of the crowd is becoming more acute. In modern cities, population density is very high, even higher in crowded places: public transport, stadiums, concert venues, mass events on the streets of the city, etc. Usually this does not cause problems, but when an emergency occurs (fire, terrorist act), large crowds of people in a confined space become a source of great danger.

An analytical solution to this problem appears to be very complex due to the large number of unknown and difficult-to-measure parameters. Therefore, in the framework of this work, computer simulation will be applied.

The approach used in this work is based on potential forces of a social nature and ordinary physical effects such as friction, elastic collisions, and others. This approach originates from the works of the famous mathematician Dirk Helbing [3].

As part of this master's thesis, we will try to improve this approach and expand the scope of its possible use through the use of path search algorithms on the plane. This will allow the method to be used in places with complex geometry, many inputs and outputs, and to simulate additional effects by varying the parameters of the algorithm. An algorithm for finding the shortest path on the plane A * was chosen as the base one.

Relationship of work with scientific programs, plans, themes. The work was carried out at the Department of Automated Information Processing Systems and the Office of the National Technical University of Ukraine "Kyiv Polytechnic Institute. Igor Sikorsky" within the framework of the theme "*Creation of simulation means for discrete-event systems*". State registration number 0117U000923.

The purpose is increasing the security of mass events by simulating the search for the shortest path in the crowd.

To achieve the goal, you must accomplish the following tasks:

- to develop methods of adaptation of the algorithm A * to the mechanical model of simulation of the behavior of the crowd;
- implemented as a software product;
- conduct experiments on the use of real data;
- adjust the parameters of the algorithm;
- test the software product in near-realistic conditions.

The objects of research are models of movement of large masses of people in a confined space.

The subjects of research are algorithms for pathfinding in the crowd.

The research methods used in this paper are based on simulation of continuous computer simulation (dynamic simulation).

The scientific novelty of the obtained results is to develop a method for adapting the algorithm for finding the shortest path to the mechanical model of the task of simulating the behavior of the crowd. And also his modification aimed at bringing the agent's behavior closer to the behavior of the real individual in the crowd.

Publications Theses to the work were published in the framework of the conference "*Computer Science and Computing FIOT-2018*". Materials of the work will be published in the framework of the 7th All-Ukrainian Scientific and Practical Conference "*Scientific Ukraine: Problems of Present and Future Prospects*" and in the journal "*Actual Problems of Automation and Information Technologies*".

CROWD DYNAMICS, PATHFINDING ALGORITHMS, A* ALGORITHM,
PANICKING CROWD, EVACUATION SIMULATION