

Mathematical and Computer Modeling of Active Movement of People During Evacuation from Buildings

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Abstract. One of the forms of protecting the population from emergencies is the controlled evacuation of people from buildings for the required time, calculated on the basis of their design and planning decisions. For this purpose, scientifically sound plans for evacuation of people are developed, the main component of which are the programs of modeling of human flows, which adequately reflect the real processes of movement of people. In this work, it is proposed to take into account the natural deformation of the human body by rotating parts of its body (eg, the shoulder) when modeling flow motion. For this purpose, it is proposed to present the projection of a human body of a set of three ellipses: the main with the possibility of its rotation in the framework of maneuverability with respect to the basic direction of movement, and two ellipses, given by the half-axis's, which are equal to half the length and thickness of the shoulder with the possibility of their rotation. in a given range of angles in the horizontal plane relative to the raised arm of the person. Such a problem arises with the active movement of people in the flow of high density, when the category of movement changes from free to compressed. The paper formalizes the constraints, builds a mathematical model of the active movement of people in the flow, provides examples of computer simulation of the movement of people, which represented by a three-component models.

Keywords: Emergency situation · Mathematical model · Flow simulation of people in the flow · Natural deformations of the human body · Computer simulation

1 Introduction

In the last decade, there has been a tendency for an increase in the number and scale of the consequences of emergencies. Emergencies are accompanied not only by material

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