The Domino Effect

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1 Introduction

A row of dominoes, standing on edge, will undergo a cascade when the first domino is tipped. In this process every element knocks the next and imparts an energy to it. In this process the potential energy of every domino changes into the speed of moving dominoes and loses in the dominoes impact.

1.1 The purpose of the investigation

The purpose of this work is:
The investigation of wave speed dependence on various domino parameters, such as the number of elements, the distance between dominoes and their dimensions.
Theoretical examination of falling domino process: creation of the mathematical model of the process, comparison between the calculations and experimental results.
Examination of the falling domino chain composed of unequal dominoes.

1.2 Method of the investigation.

The process of domino cascade was filmed on a video with using of the speed camera with frame rate 2500 fr/sec. The equal dimensions dominoes was located at the same distance between neighbours. First domino started from rest at a position of an unstable equilibrium. An image from the camera is presented in Fig.1. You can see the falling of steel dominoes 4 cm height and located at space 2 cm between them.

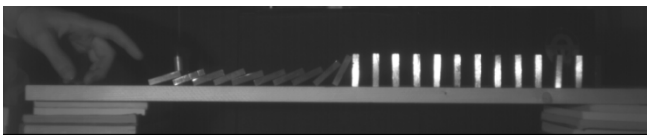

Fig.1 Falling dominoes

1.3 Results of the experiment

With using a computer data processing the dependence of the time of domino falling on the number of elements, the distance between them was measured. The dominoes of 3 types of material were used. The results of the measurements is presented in Fig.2.

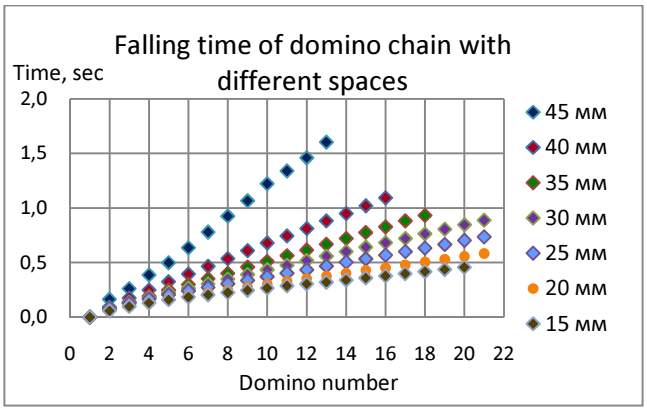

Fig.2. The experimental dependence of falling time on the number of dominoes for different spaces between dominoes.

The program for computer calculations was written. Time of a row of dominoes falling without friction between neighbors was calculated. By using this program the dependence the wave of falling dominoes speed on start speed of the first domino was calculated. The calculation results show that the speed of falling dominoes reaches its constant value. This stable speed depends on the geometric parameters of dominoes.
The falling time of a domino chain composed of unequal elements was calculated. The domino of different masses was examined (cases with growing and decreasing masses).

1.4 Results

The theory of the dominoes falling was developed. The wave speed of falling dominoes was observed experimentally and theoretical.