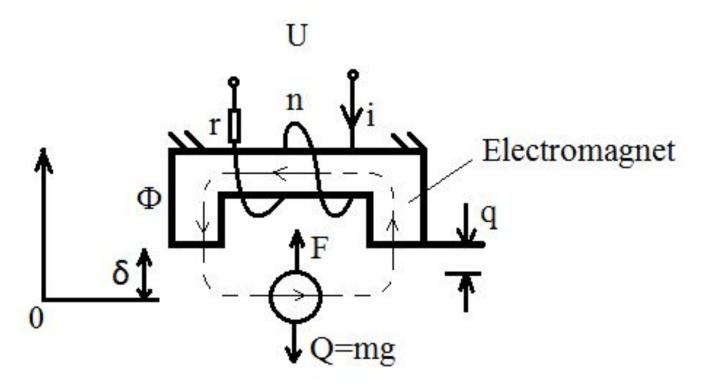


# Levitron – Perpetuator Business plan

Created by "Next Generation":

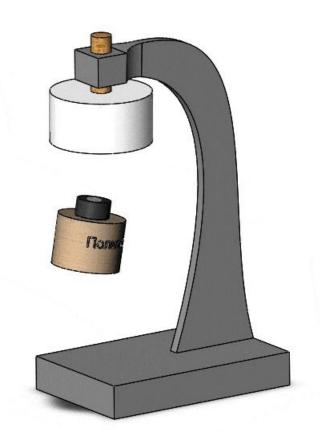
Robert Kalimullin
Anna Kozlova
Bator Rinchinov
Marina Vladimirova
Valeriya Kolesnikova
Nataliya Khrustaleva

#### General description of the idea



**U**-control voltage; **r**-resistance; **i**-current; **n**-number of rounds of a magnet coil; **Φ**-magnetic flux; **F**-magnetic force; **Q**-gravitational force; **q**-the current value of the air gap between a body and poles; **δ**-necessary distance of a body from electromagnet poles; **m**-body weight; **g**-acceleration of gravity.

#### Graphic representation of a levitron



#### Mathematical description

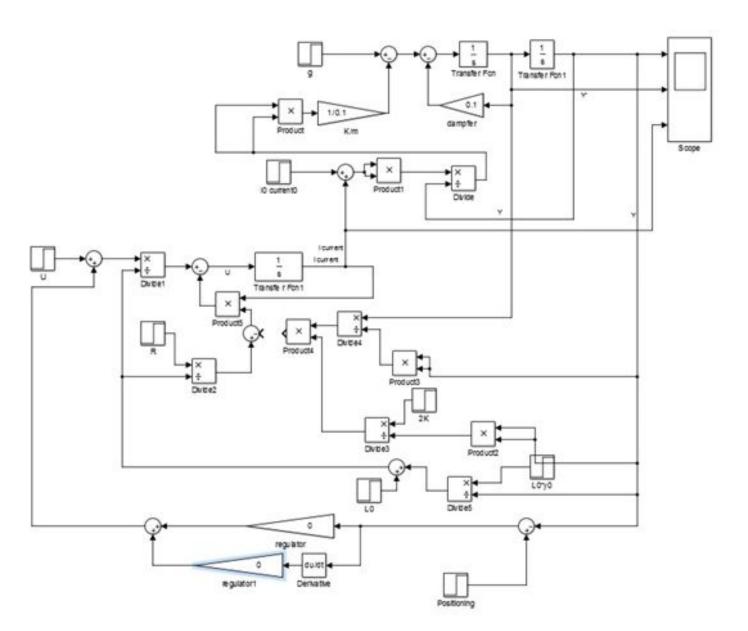
$$\begin{cases} \frac{dx_1}{dt} = x_2 \\ \frac{dx_2}{dt} = g - \frac{K}{m} \left(\frac{x_3}{x_1}\right)^2 \\ \frac{dx_3}{dt} = \frac{1}{L(y)} u - \left(\frac{R}{L(y)} + \frac{2K}{y^2} \frac{x_2}{x_1^2}\right) x_3 \end{cases}$$
,  $x_1 = y$ ,  $x_2 = \frac{dy}{dt}$ ,  $x_3 = i$ ,  $u = v_i$ 

**i** – current in the coil, **R** – coil resistance, **L** – inductance,

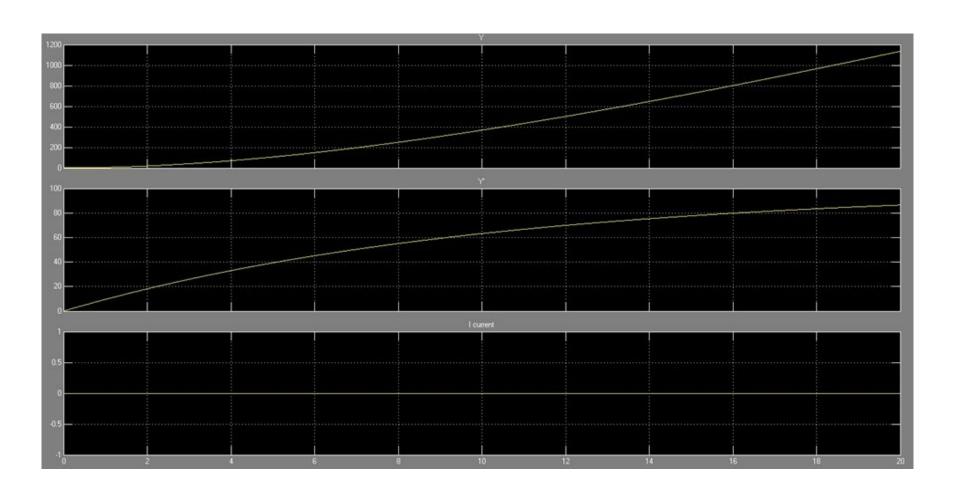
y – distance between an object and an electromagnet,

**K** – electromagnetic constant, **v** – traveling speed of an object, **m** – mass of an object.

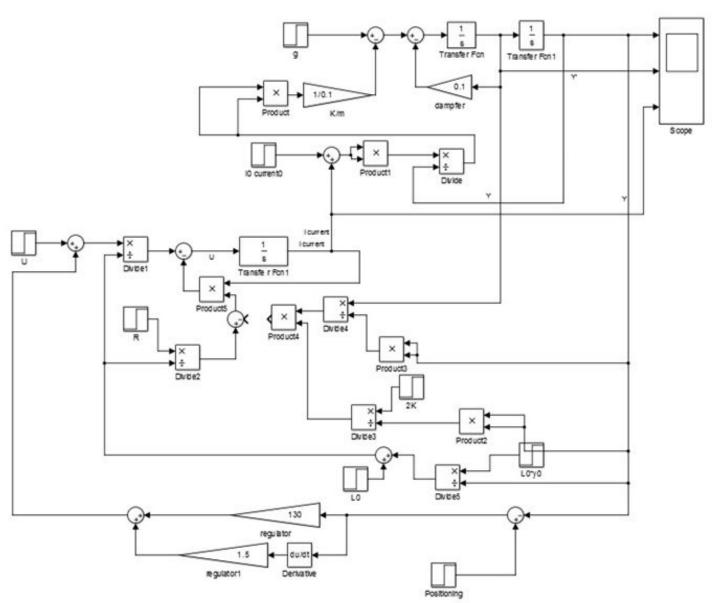
## Mathematical justification (1)



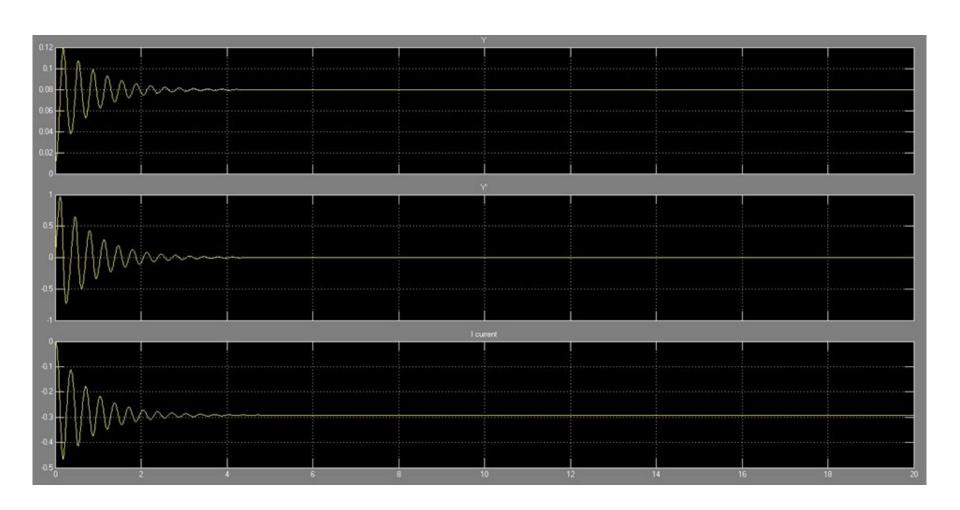
### Mathematical justification (2)



### Mathematical justification (3)



### Mathematical justification (4)



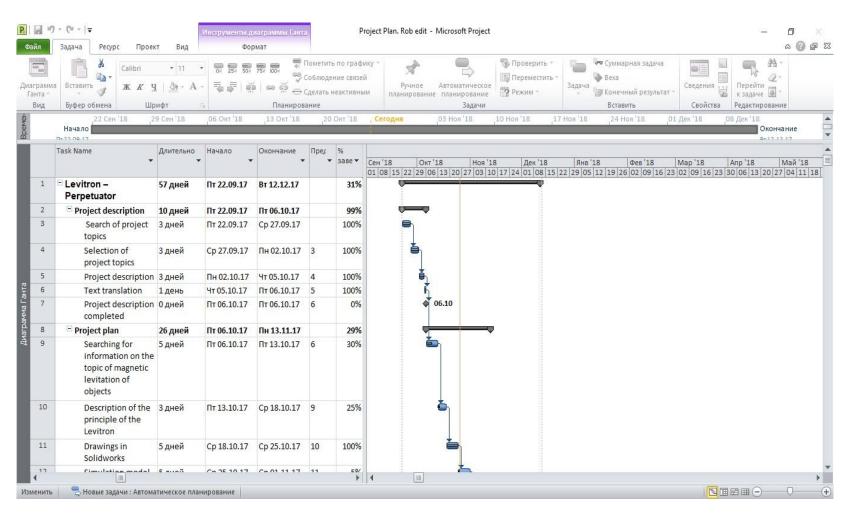
# List of components and common budget of the project

Table 1. Elements of a levitron

| table 1. Elements of a levition                          |                             |
|--|-----------------------------|
| <b>Detail</b>  | Cost with delivery, rubles. |
| Copper pro-wolf of 80 meters                             | 182,00                      |
| The linear sensor of Hall (UGN3503UA model) of 10 pieces | 1 275,00                    |
| The steel core from a door loop with a diameter of 20 mm | 110,00                      |
| Hot glue   | 598,00                      |
| Quadruple operational amplifier of LM324N                | 22,00                       |
| Resistors  | 15,00                       |
| Condenser  | 800,00                      |
| Small neodymium magnet * 2                               | 100                         |
| Diode detector 1N4007 * 2                                | 4,00                        |
| Arduino UNO microcontroller                              | 520,00                      |
| Resistors 5,6 * 2  | 61,00                       |
| Field transistor   | 5,00                        |
| 2 diodes of Shottki of 30 Amperes 45 Volts               | 110,00                      |
| L-63YT light-emitting diode yellow                       | 20,00                       |
| L7805CV voltage regulator (5B, 1.5A)                     | 10,00                       |
| Adapter of a delivery Ginzzu GA-1040U                    | 1 110,00                    |
| Arm  | 180,00                      |
| Measuring glass  | 49,00                       |
| Basis  | 39,00                       |
| Total  | 5 110,00                    |

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# Schedule of implementation of the project



# Application and commercial justification





#### Thanks for an attention!!!