

# Multimedia Interactive Simulations of Physical Experiments

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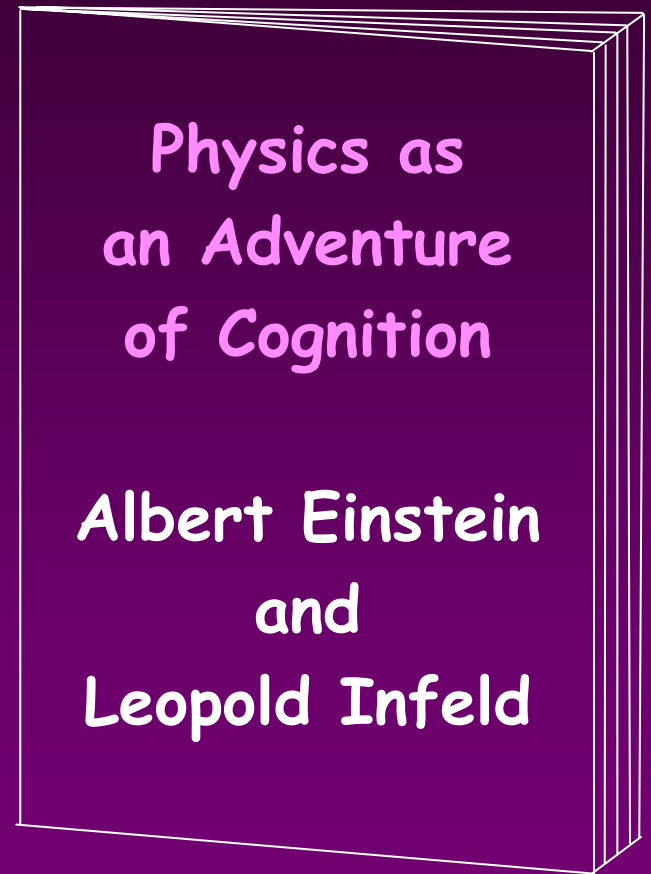
# Overview

- ❖ Goal + Motivation
- ❖ Related Approaches
- ❖ Interaction
- ❖ Testing + Conclusions
- ❖ Demonstration
- ❖ Future Work

2 kg

# Goal

To create an educational, interactive and multimedia application, which in the same way as our resource book, helped to find and understand relations in physical phenomena.



3 kg

# Motivation

4 kg

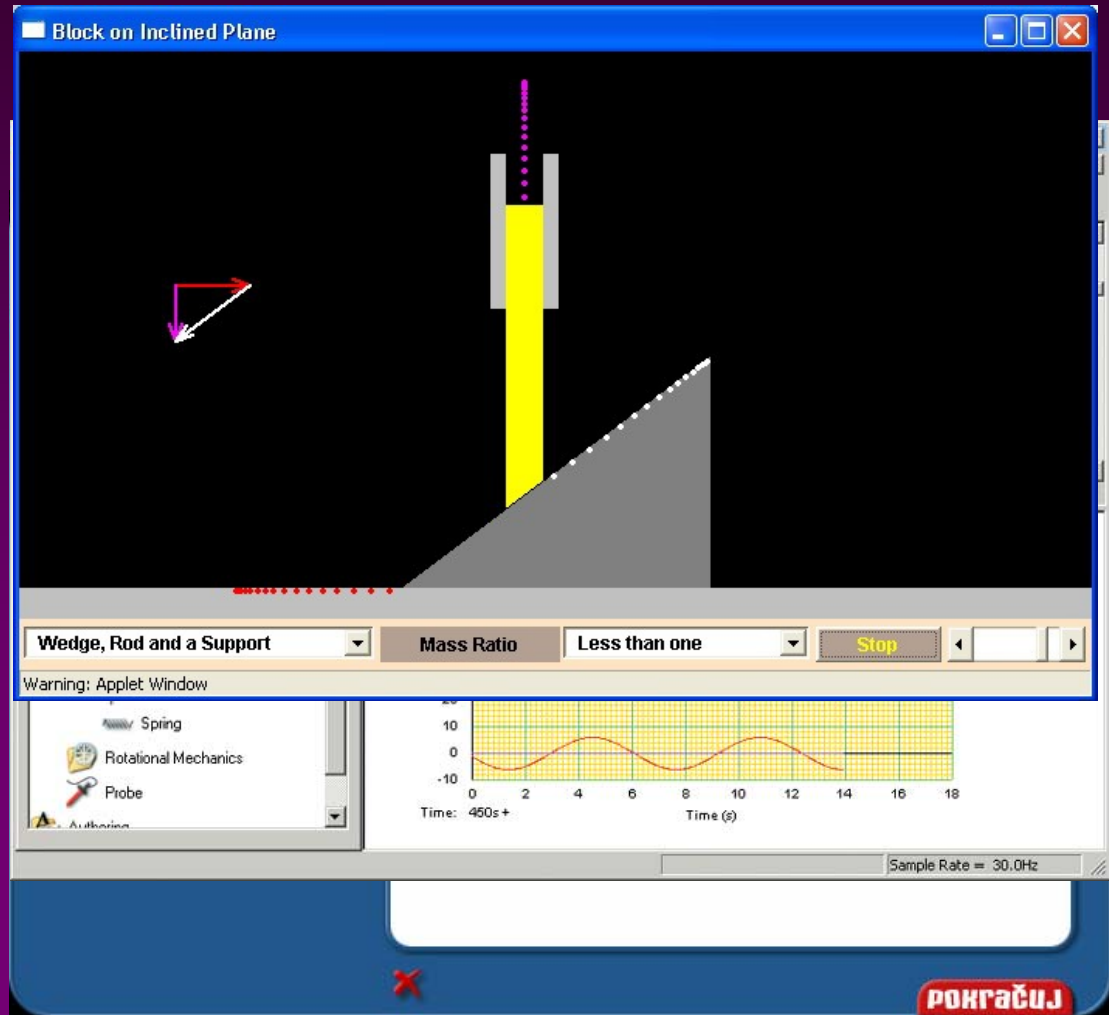
Children want to play

- ❖ The real games (physical experiment)  
+ touch
- ❖ Experiment in our application  
+ possibility to change many other  
parameters

# Related Approaches

5 kg

- ❖ Applets on web pages
- ❖ Crocodile Clips
- ❖ Didakta -Fyzika



# Interaction

6 kg

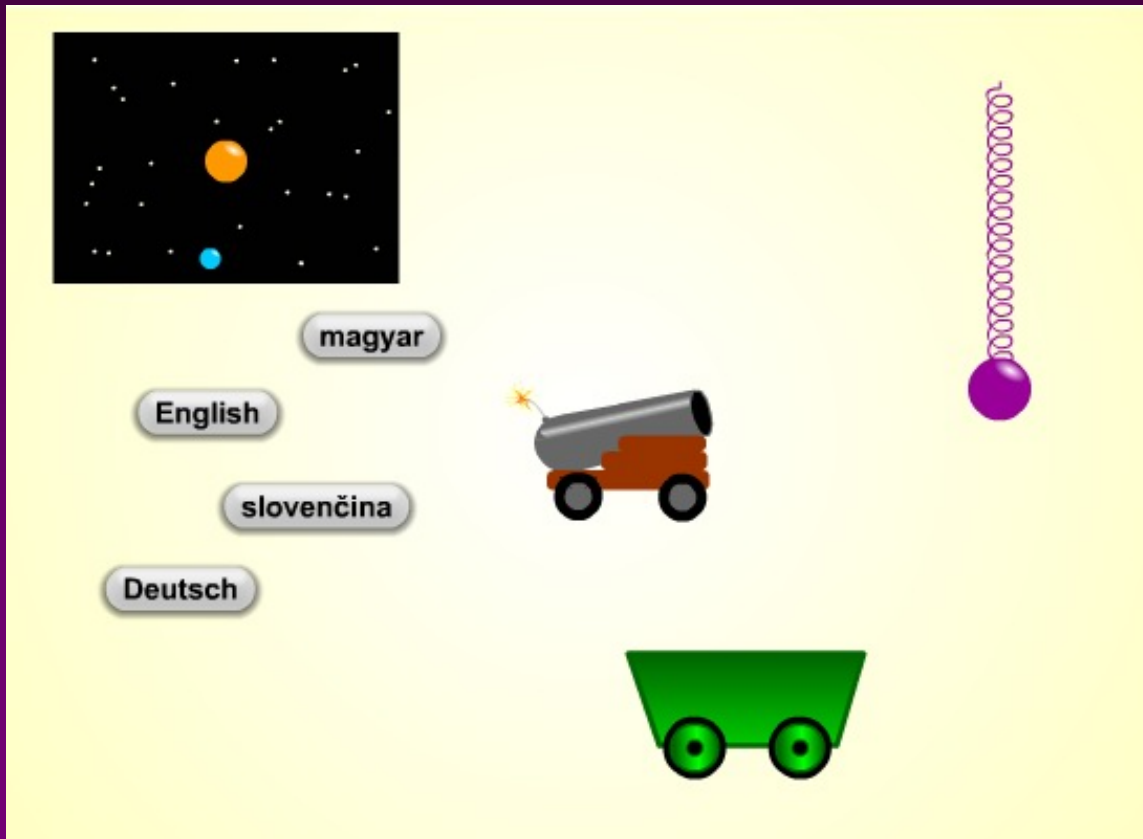
- ❖ Ones own experience is the best teacher
- ❖ People like to control

# Scenario

level 1

7 kg

## The Introduction



# Scenario

level 2

8 kg

Each experiment contains

- Instructions
- Questions
- Interactive simulation

How does the mass of the ball influence the radius

- a) in a vacuum
- b) in an environment with non-zero density?

interactivity experiment

|              |          |                       |        |       |
|--------------|----------|-----------------------|--------|-------|
| in direction | velocity | acceleration          | mass   | 10 kg |
| horizontal   | 7 m/s    | 0 m/s <sup>2</sup>    | angle  | 49 °  |
| vertical     | -8.1 m/s | -9.8 m/s <sup>2</sup> | height | 2.7 m |
| of moving    | 11 m/s   | 9.8 m/s <sup>2</sup>  | range  | 14 m  |
|              |          |                       | time   | 1.9 s |

STOP!

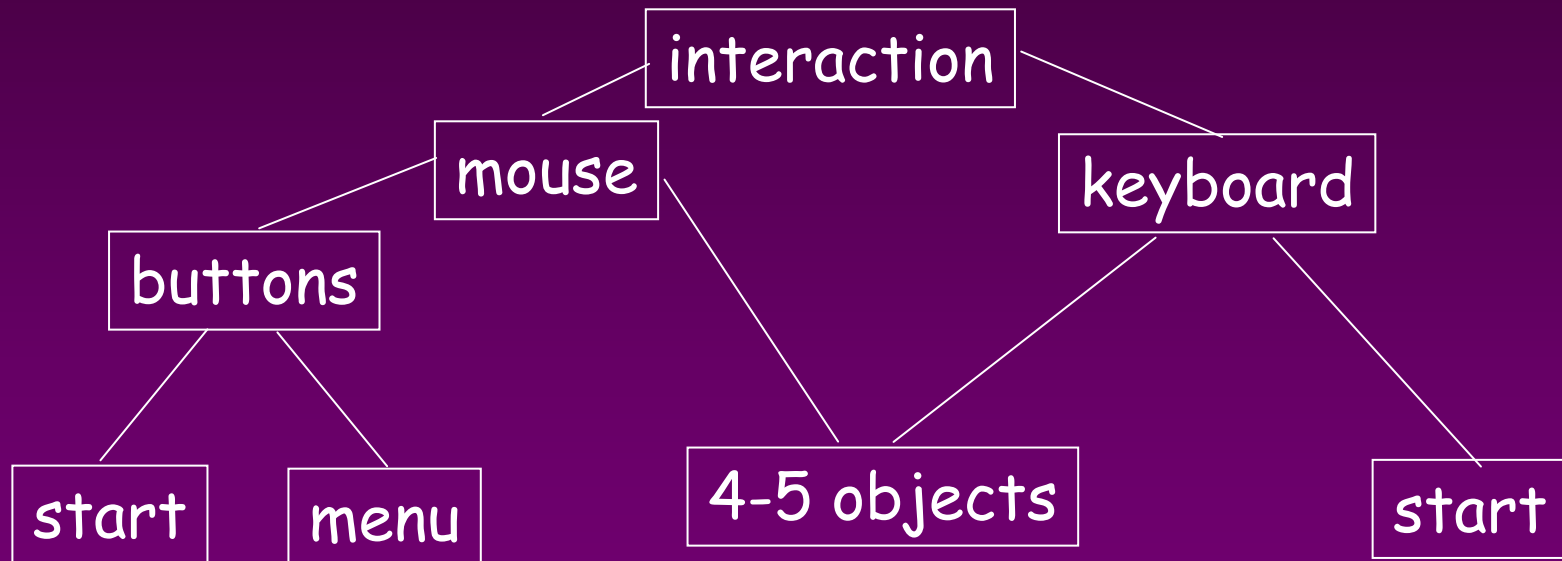


# Scenario

level 3

9 kg

Interactive simulation



# Scenario

level 4

10 kg

## MENU:

hide numbers

change numbers

interactivity

questions

content

|            |       |                        |         |
|------------|-------|------------------------|---------|
| angle      | 9 °   | time                   | 3.5 s   |
| length     | 60 cm | velocity of sphere     | 27 cm/s |
| mass       | 34 g  | velocity of rotation   | 0 °/s   |
| stretching | 200 % | velocity of stretching | 0 cm/s  |

|                      |                       |       |
|----------------------|-----------------------|-------|
| angle                | -9 °                  |       |
| mass                 | 34 g                  |       |
| stretching           | 141 %                 |       |
| angular velocity     | 0 °/s                 |       |
| radial velocity      | 0 cm/s                |       |
| equilibrium length   | 30 cm                 |       |
| koefficient tuhosti  | 5                     |       |
| gravitational accel. | 9.81 m/s <sup>2</sup> | Earth |
| time step            | 0.04 s                |       |

reset

OK

# Sounds

11 kg

- ❖ To hear or to read?
- ❖ Recording wav-files
- ❖ Compression to mp3-files (Lame)
- ❖ The biggest part of application
- ❖ Multilingual

# Testing

12 kg

- ❖ Pre-testing (20 people)
- ❖ Testing with children
  - 8-9 years old (3x15 children)
  - 14-16 years old (2x15 children)

# Conclusions

13 kg

- ❖ Application is appropriate for children who have already started learning physics
- ❖ Supplementary learning tool in the educational process
- ❖ Support the children's understanding of physics

# Demonstration

14 kg



STOP!



uhol 4 °  
dĺžka 51 cm  
hmotnosť 66 g  
natiahnutie 181 %

čas 11.4 s  
rýchlosť gule 29 cm/s  
rýchlosť otáčania 32 °/s  
rýchlosť natáhovania -6.4 cm/s

# Future Work

15 kg

- ❖ Record sounds also for questions
- ❖ Add some music to silent places
- ❖ Create more experiments
- ❖ Create version for Internet = sounds replaced by texts
- ❖ Create experiments as interactive realistic 3D models

Thank you for your  
attention

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