

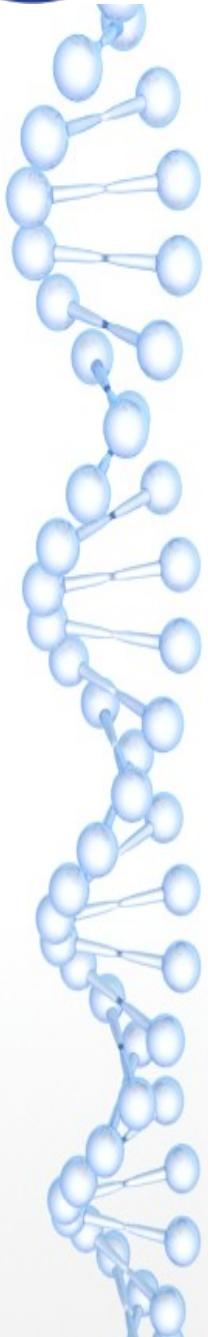


The Abdus Salam

International Centre
for Theoretical Physics

www.ictp.it

Workshop on Computer Programming
and Advanced Tools for
Scientific Research Work



Genetic Bike

David Grellscheid
Matias Nunez
Marco Pividori
Mojtaba Alaei
Maria Verina
Syed Hasibur Rahman

Project Insight

To **Design** the most suitable
Bike with **Genetic Algorithm**
that can **Run** on a **Arbitrary**
Terrain with full **Physics**
and **Dynamics** with
Visualization

Team Work

Understand the problem

Identify individual parts

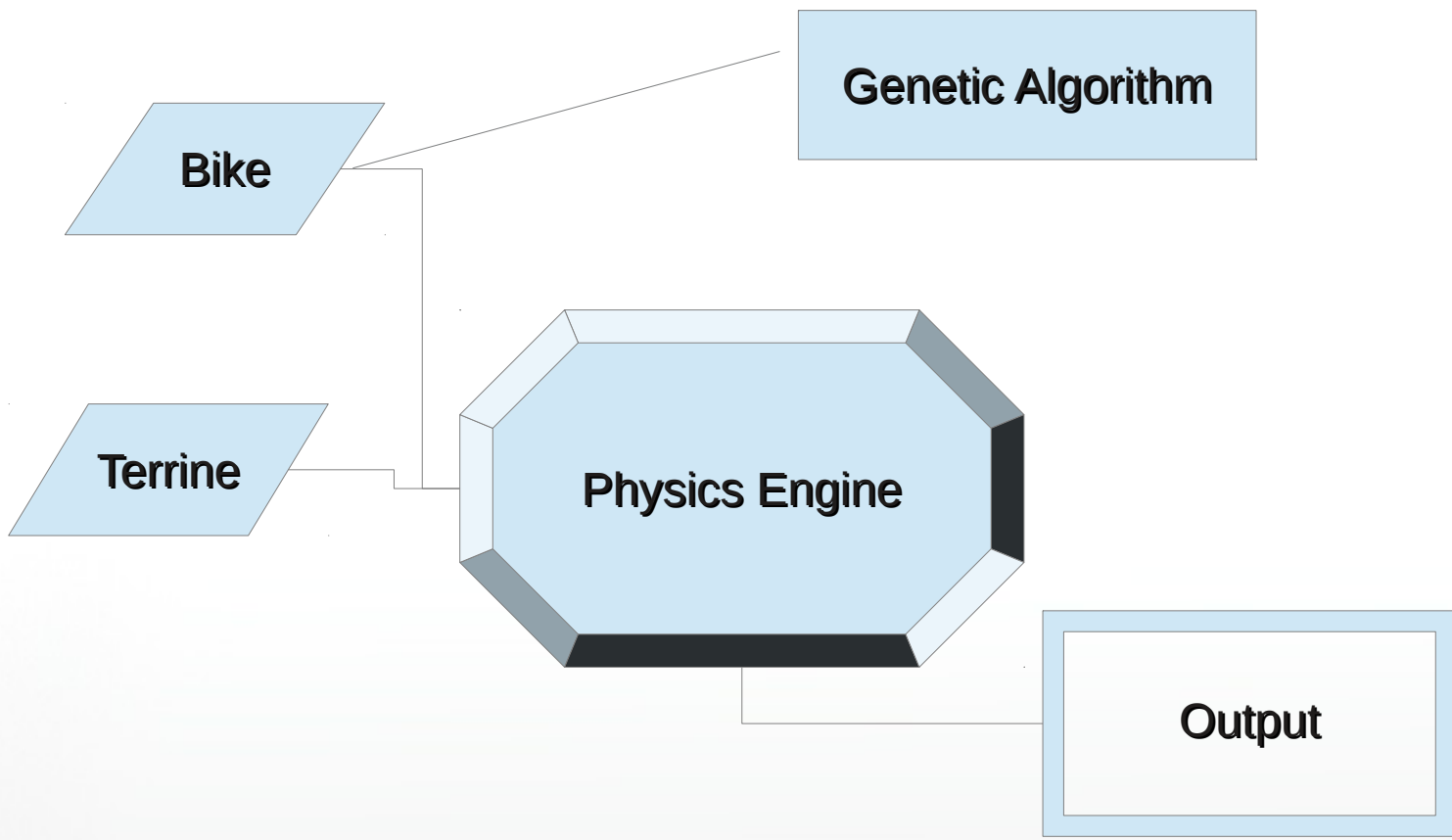
**Assign each parts to a member
and start developing in
parallel**

Test each piece individually

Integrate all together



Task Division



Genetic Algorithm

Properties of Bike becomes each Genes i.e.
Radius and masses of wheels and loads, spring
constant and length to form the Genome

The whole bike represents one Organism

20 random bike/organism initiated Randomly
within boundary conditions make the Population

Fitness function decided to be the longest
time bike can travel on the terrain

Reproduces 20 new bike from the fittest 20%
among the population by crossover and with a
1% mutation probability for next Generation



Physics Engine

Apply constant acceleration on bike

Calculate the interaction with
terrain and gravity using
Runga-Kutta model

Calculate Fitness Value

Animate the bike by updating bike
position and orientation

Visualization

Draw the terrain

Draw the bike constructed by
Genetic Algorithm

Animate the bike with help
of Physics Engine



Tools for Teamwork

Source Control with **git** on remote repository:

<https://bitbucket.org>

Our repo

`git clone https://hasibur@bitbucket.org/hasibur/geneticbike.git`

Team Collaboration with

Trello

[<https://trello.com>]

Mimicking distributed teamwork

Team Background

**Nobody knows Genetic Algorithm what
so ever**

**Nobody has experience on applying
and animating object with Physics
accept Matias**

Nobody knows python well enough



The Abdus Salam
International Centre
for Theoretical Physics

www.ictp.it

smr2503

Genetic Bike

Now . . . where are we???

Demo

Checklist

Design and Draw Bike

Genetic Algorithm

Run/Animate Bike

**Drawing Arbitrary Terrain
Physics Engine with Dynamics**

Combined Output Visualization

What we Learn : **Pros**

**Parallel work on one project
makes development faster**

**One can only focus on one part
of the project**

How to work on a Team Project

Documentation while coding

Helping each other

What we Learn : **Cons**

**Team Meeting can be annoying
sometime but very important for
project**

**It's hard to keep up the speed
sometime**

**Too much discussion helps
loosing focus very easily**

Helping each other



Knowledge we gain

Python - of course

Source Control "Git"

Collaboration Tool - Trello

Better Teamwork



The Abdus Salam

International Centre
for Theoretical Physics

www.ictp.it

smr2503

Genetic Bike

Some comments

We got to different parts working but failed to integrate. One more day was needed. Communication timing problems took us a lot of time. The time frame was not enough

--- Matias

Lack of initial organization: we started working before everything was scheduled to try to obtain an early insight of the result. But it was nice to program a piece of code that someone else will use inside the project.

--- Marco

Collaborating with people with different background is hard job. Working with python is enjoyable.

--- Mojtaba



**Enough for a 3 days project
from scratch without any
experience . . .**

Thank you . . .

