



Atomic Race

Don't Panic! Escape Smartly!



Game Proposal

Team 1: Christian Schüller, Pascal Spörri, Nicholas Pleschko

Game Description

Story

A tiny little atom is living happily together with its friends as a part of a sun somewhere deep in the universe. All has been fine, till one day the sun is facing its end and is going to implode. It turns into a big black hole which is going to swallow everything. But this is not the plan of the tiny little atom which desperately wants to survive. The atomic race versus the space sucking event horizon of the big black whole begins! But can the atom escape eventually or will it be extinguished? Now it is up to you to guide your atom through the deep space and its lurking dangers, hidden traps and invisible streams. Do you have the skills and determination to master this challenge?

Game Mechanics

The goal of this game is to guide your atom as fast as possible through an nearly infinite two dimensional level containing various obstacles and hostile elements. To increase the difficulty and apply time pressure, an end-time scenario is modelled. If the player is moving too slow and can not overcome the obstacles in time he will lose!

The player is controlling a small atom having a certain number of

- Electrons (negative charge)
- Protons (positive charge), Neutrons (no charge)

The number of electrons and protons defines the charge of the atom. If it has the same number of electrons and protons it has no charge. Depending on its charge, the player's atom is either attracted to or repelled from poles in the level depending on their charges. He can then choose to do two things:

- Eject electrons to have a positive charge
- Split off protons to get a negative charge and reduce its weight and size and become a simpler chemical element

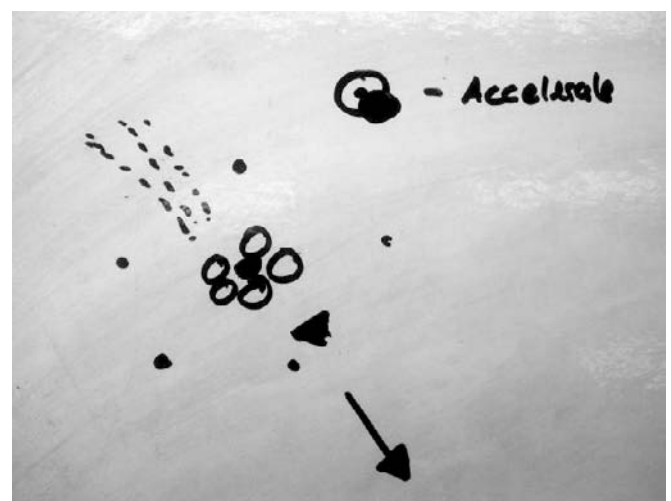
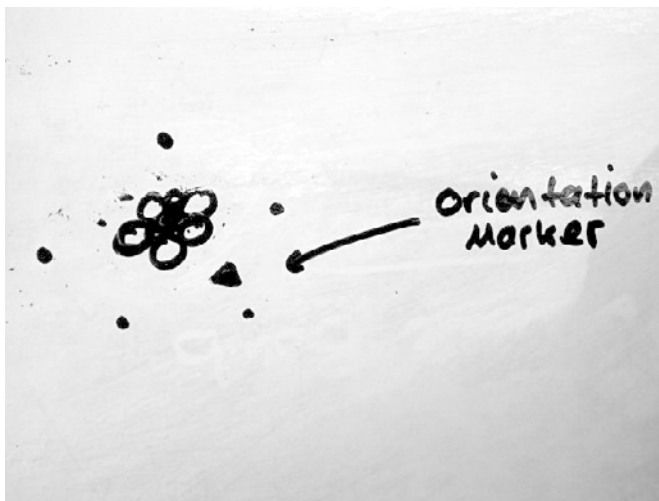
The simplest atom is the Hydrogen element with one electron and one proton which can not lose any further protons or electrons. It is very light and therefore more difficult to control in the presence of strong poles. Additional electrons and protons can be gathered throughout the level and be used to maintain the flexibility to change the atom's polarity as often as possible. The electrons and protons build the basic elements for the multi-player interaction. The current properties like the element type, size and charge of an atom play a crucial role in the process of progressing through the level.

Movement Principles

In atomic race there are 2 main movement principles which can be used to control the atom.

Acceleration Jet

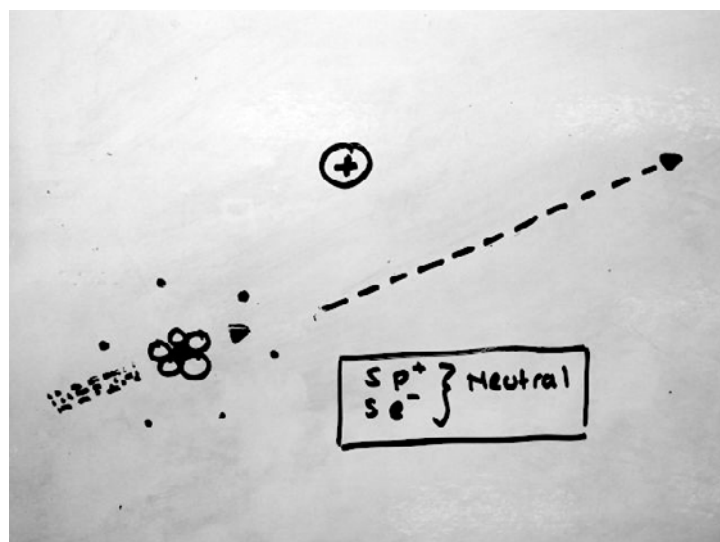
The first and easiest method to control the atom is using the acceleration jet coming out of your atoms back. You can use the left stick of your controller to change the orientation of the atom and activate the booster. Although one can use this jet indefinitely it only allows to accelerate to a certain end velocity. The main purpose is to fine tune all the movements to get out of difficult situations. The acceleration force of the jet increases proportionally to the weight of the atom to account for the inertia of the mass.



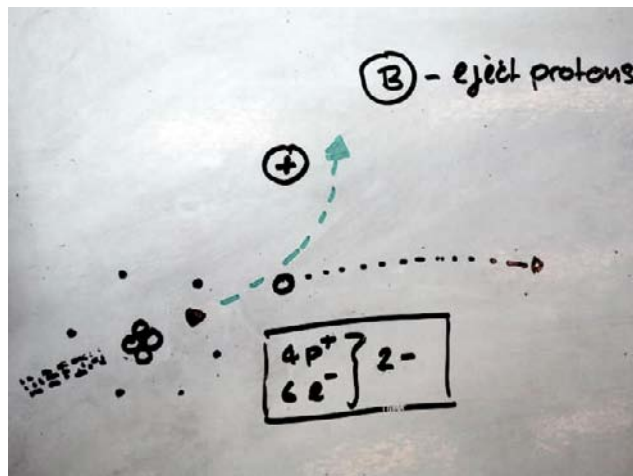
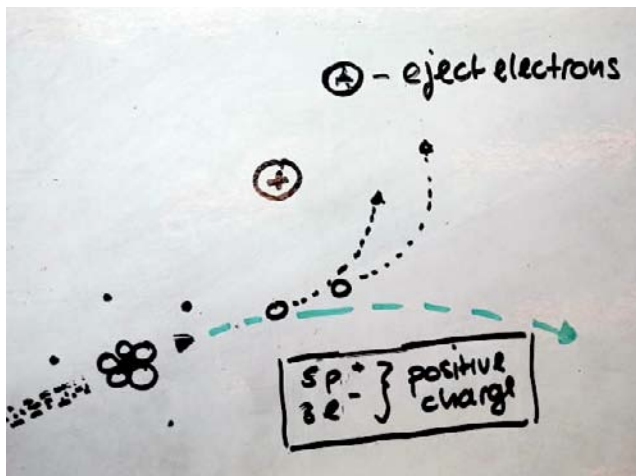
Change Atomic Charge

The second movement principle is the ejection of electrons and protons. This doesn't change the velocity directly but effects the charge and in the case of protons also the mass. Equally charged atoms and or poles repulse each other and vice versa.

By pressing the A button single electrons are ejected in the direction of the orientation.



If the player starts in an uncharged state with the same number of electrons and protons, the ejection of electrons will result in a negative charge of the atom. Therefore, it will get attracted by positively charged poles. It is also possible to eject protons which will lead to a positively charged atom and consequently will get repelled by positive charged poles.

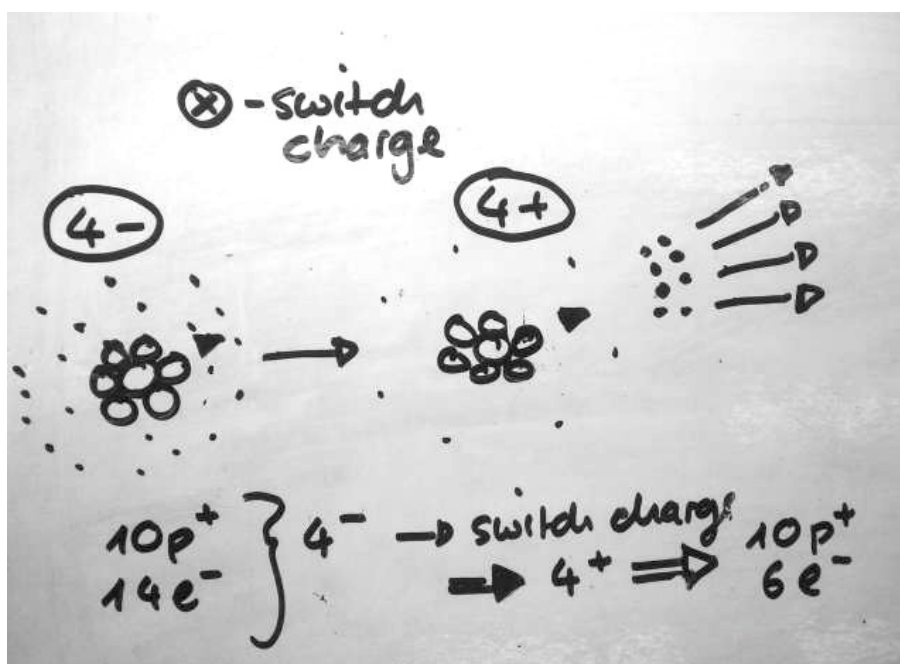


Controls

In order to simplify the controlling we introduce a couple of shortcuts to the previously described methods.

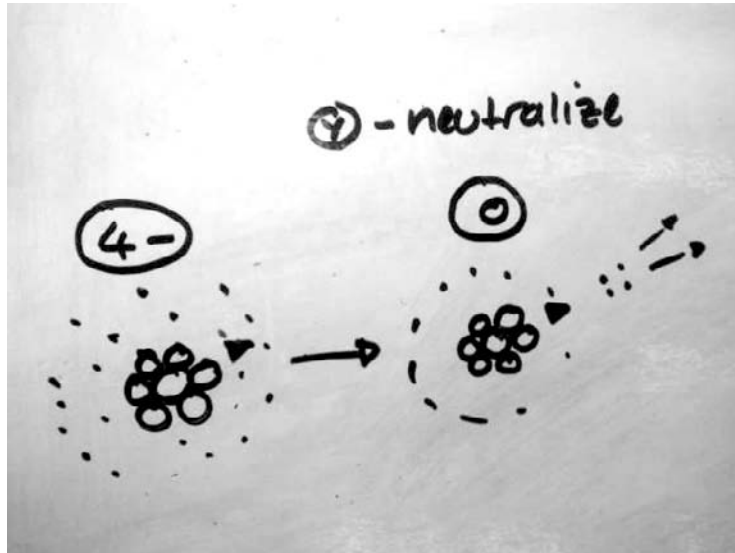
Inverting Charge

To instantly invert the current charge one can press the X button which will lead to the ejection of exactly the right number of protons or electrons to invert your charge. If the atom has a charge of +4 (4 protons more than electrons), the X button will eject 8 protons from the atom. This process allows a very fast switching of the polarity with the drawback of losing electrons or protons. Therefore, the primary goal as an atom is to gain as much protons and electrons as possible in order to be able to switch the charge as often as possible.



Neutralize Charge

The second shortcut is called **neutralization**. Instead of inverting the charge it will neutralize the charge by equalizing the number of protons and electrons. By pressing the Y button you will automatically lose as much electrons or protons as are necessary to neutralize your charge. With this technique the player can get out of trouble when he is stuck between charged objects.



Control Overview



Multi-player

Interaction

The following methods describe the possible interaction between different players. All former rules and principles also apply in the multi-player mode.

Collision

Atoms of different players collide. This may result in the following reactions: Depending on the mass of each atom use conservation of momentum to apply collision reaction. Depending on the relative speed of the atoms some electrons/protons will get split off. Therefore, a heavy player can push lighter atoms to get them off the course.

Attraction/Repulsion

As already described in the former part, each atom has a certain charge and thus may be attracted to or repelled from each other. As the bigger atoms have a greater inertia, they will be less influenced by small atoms and vice versa.

Electron/Proton shooting

All protons and electrons which get ejected from a players atom, will be shot in the current forward direction. If they hit another players atom core, they will be added to them and will affect its charge. This is the same principle as the collection of free electrons and protons.

Advanced Methods

Additional interaction method ideas like linking or fusion are omitted at this point and may be explored only if there is plenty of time.

Multi-Player Screen

In the multi-player mode there is no split-screen as usual. All players are playing on the same full screen. These causes the issue with the maximal possible display area between two different advanced players. To resolve this problem we apply an additional multi-player game constraint. The fastest player can push the right border of the level which also moves the depending left border. Therefore, all players which are too slow will be relocated behind the front player but loose some protons and electrons as a penalty.

Co-Op Mode

In the co-op mode players can form teams and fight together versus the others. Therefore, they only lose if both of them get sucked by the black hole within a certain time. If only one player of the team is too slow he will get spawned to the same position as his teammate.

Atomic Classes

There are about 120 known chemical elements based on the number of protons of an atom. We are dividing them into 5 groups, each having a special ability to compensate for their specific weaknesses due to their different masses and sizes. It also provides an additional game play feature, which motivates the players to abstain from changing their polarity and become very heavy atoms for the price of getting a very good special feature like the atomic bomb. The special features increase in quality and coolness for heavier atoms. In the single-player mode there will be different abilities available than in the multi-player mode.

Possible **classes**:

- Super light
- Light
- Normal
- Heavy
- Super heavy

Possible **abilities**:

- Boost - Extra powerful acceleration ray for a limited time and increases max speed
- Shield - No influence through flows
- Nuclear Fission - Splits an atom and results in 2 controllable atoms
- Freeze - Instantly stops atom
- Super Charge - Applies a strong attraction or repulsion on to each opponent
- Atomic bomb - Chain reaction reducing each opponent to a light atom
- Destroy poles - Destroy annoying poles
- Anchor - Create an anchor on the level and helps the player move around an obstacle
- Beaming - Beam to a place into the level
- Stop time - Stop the time limit for a certain amount of real time

For every class there will be such a special ability which can be used after certain time intervals.

Level

The levels will be generated procedurally based on random parts with a certain difficulty rating. In addition manually created parts will be added to introduce puzzle like sections.

Obstacles

In the game there exists a couple of different obstacles types.

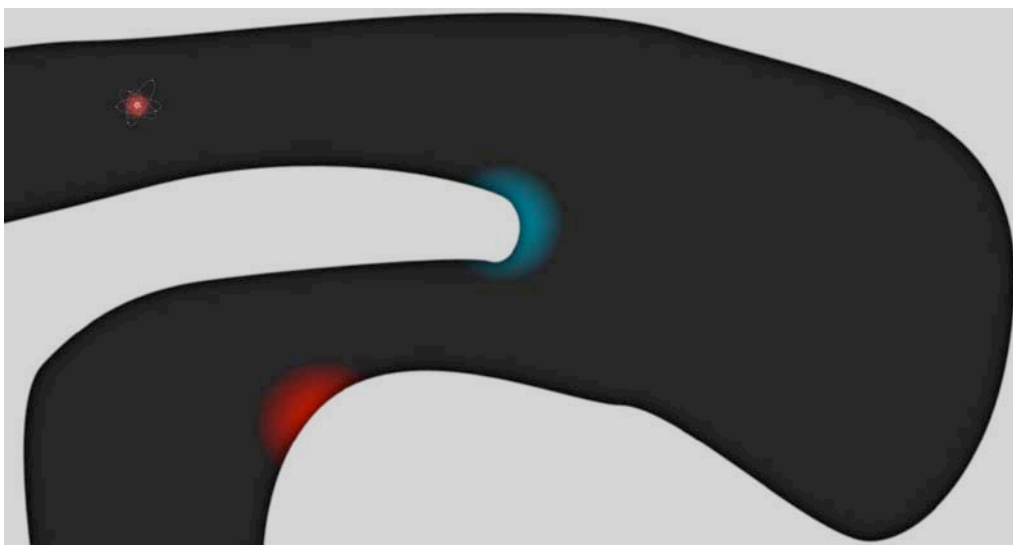
Boundaries

Boundaries, expressed with the gray color, limit the movement of the player. If a player collides with a wall, he loses electrons and protons (depending on the hardness of the crash).



Poles

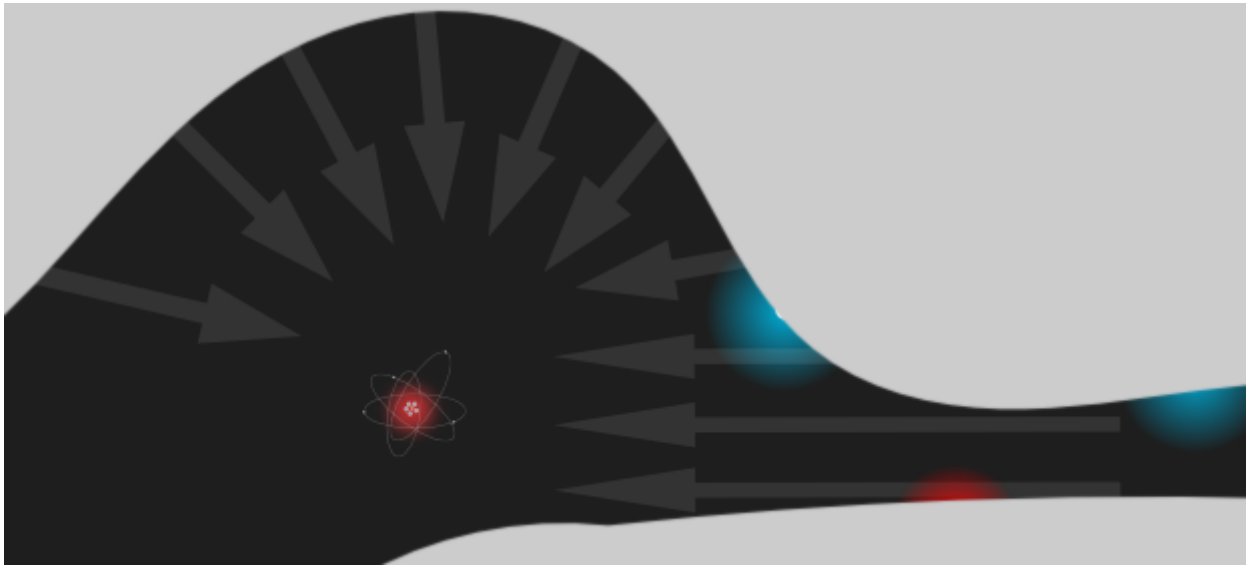
Poles act as simple attraction and repulsion points. Depending on his charge, the player is either attracted, repulsed or not affected by a pole. Poles can be used to force a player to switch or neutralize his charge. Or allow him to get faster through the level.



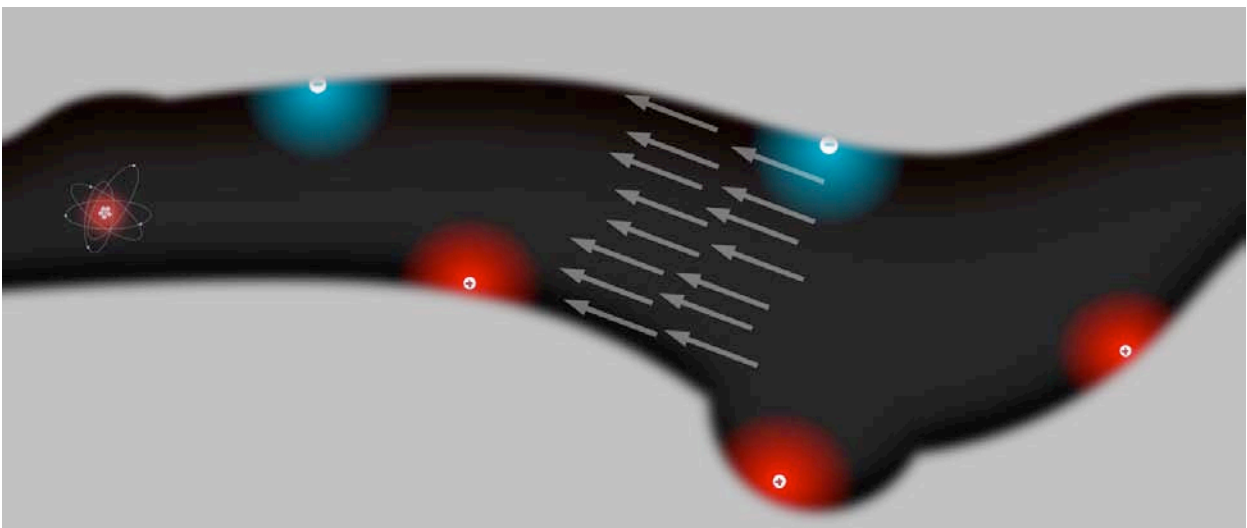
With this setting the player is able to move around without ever touching the poles when he has no charge.

Vector Flow Fields

Vector fields force the player to move in certain directions. Depending on the strength of this field, the player is only able to move himself out from this field using his charge. This represents a central game-play mechanic.

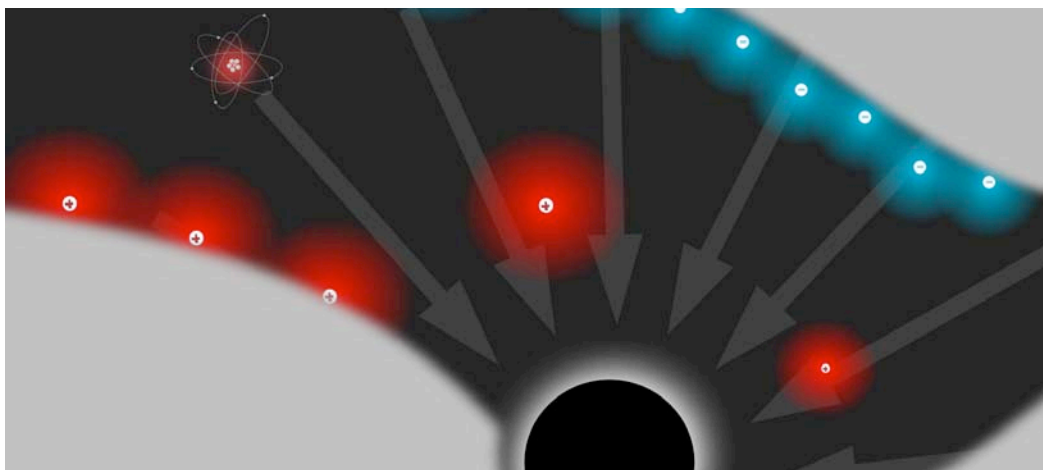


As we see in the image above, the player needs to switch his charge if he wants to reach the end of the level.



Black holes

Black holes act as a very strong vector field. When the player is sucked into the hole, he dies. Strong poles are then placed around this hole to help the player getting out of it.



Dynamic Elements

Dynamic elements have a direct impact on the player when he collides with them.

Atoms

Atoms are the most desirable element for the player. If his atom collides with a (non-player) atom, the atom fuses with it and gets the additional protons and electrons. These atoms directly interact with the level and the player.

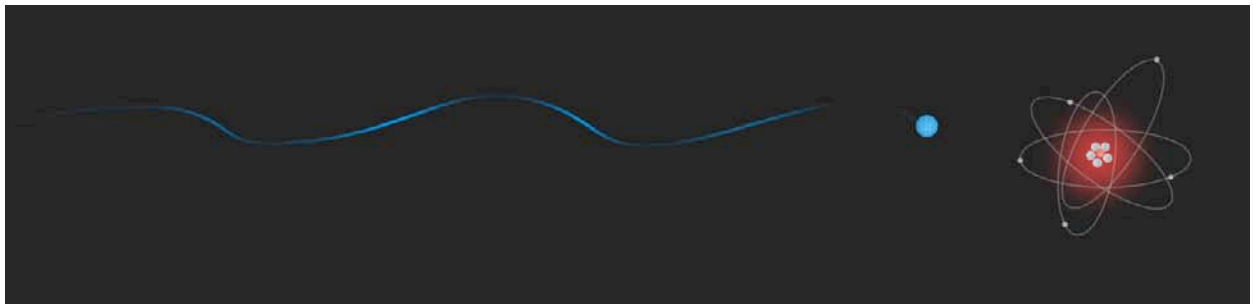
Quarks

Quarks fly through to level on a straight path. If the player collides with them, he loses at least one electron.

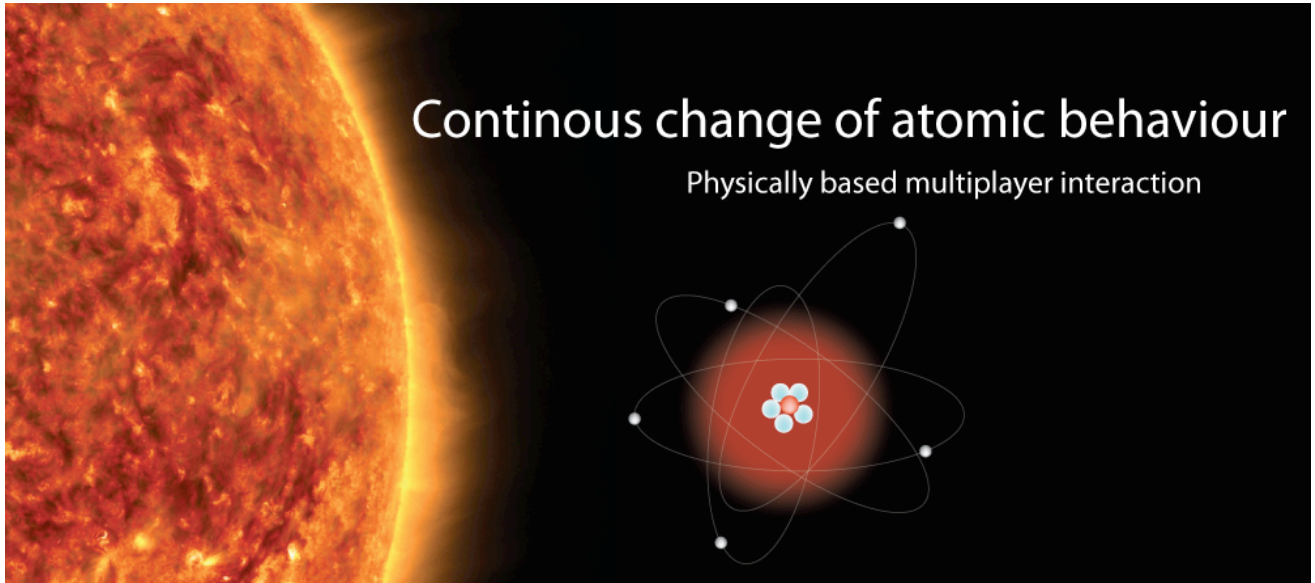


Higgs Boson

Fly through to level on a straight path. If the atom of the player collides with them, he loses at least one proton.



Big Ideas



Development Schedule

Layered Requirements

Functional minimum

- Simple Graphics

- Fully functional controls and game mechanics

- Trivial level design, no obstacles

Low target

- Simple obstacles

 - attraction and repulsion poles

 - vector flow fields

- High score

Desirable target

- Appealing graphics

- Complex levels

- Multi-player modes, player interaction

High target

- Special graphic effects

- Various obstacles

- Co-op multi-player mode

Extra

- In-game help structure (like tutorial levels, etc)

- Extra graphics

- Story

- The concept of heat

- Molecules

Schedule

Development Schedule	Project Proposal		Prototype	Interim Report				Alpha Release			Playtesting	Conclusion			
	Task	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14
Game Design Document															
Prototype (tbd: 19.3)															
Interim Report (tbd: 16.4)															
Alpha Release (tbd: 7.5)															
Playtesting (tbd: 14.5)															
Conclusion (tbd: 28.5)															
Demo Video (tbd: 28.5)															
Functional Minimum															
Simple Graphics				N	N										
Simple Level Design				P	P										
Fully functional Game Mechanics				C	C										
Low Target															
Game Menu						N	N								
Level Design						CP	CP								
Poles						CP	CP								
Vector Fields						CP	CP								
High Score						N	N								
Desirable Target															
Appealing graphics								CPN	CPN	CPN					
Complex levels								CPN	CPN	CPN					
Multiplayer								CPN	CPN	CPN					
Atomic Classes								CPN	CPN	CPN					
High Target															
Special graphic effects											CPN	CPN	CPN	CPN	
various obstacles											CPN	CPN	CPN	CPN	
Co-op multi-player mode											CPN	CPN	CPN	CPN	
Extra															

N ... Nicholas Pleschko

P Pascal Spörri

C Christion Schüller

Assessment

Our game simulates a small virtual atomic world at its last moments. Each player is controlling an atom escaping from the space sucking big black hole. His goal is to grow in size, acquiring new special abilities and overcome the obstacles in time before he gets swallowed and extinguished eventually.

The main strength of our game is its special game mechanic based on attraction and repulsion depending on the atomic charges and physical properties. Even though the movement principles are new to the players it should be easily and quickly understood and mastered. In combination with the time pressure driven, skill challenging and sometimes puzzle like levels, the game shall provide a challenging and entertaining multi-player experience.