



Simulation des particules en interaction

physX Groupe 17

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Lien gitlab: https://gitlab-cw5.centralesupelec.fr/bowen.zhu/codingweek_week2



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et conclusion



01

DESCRIPTION GLOBALE



C'est une simulation physique des particules en interaction
basée sur un moteur physique 2D.

Description globale



Produit

Interface interactive simulant des particules en deux modes : mode de diffusion et mode d'onde créé par un piston.



USAGES

Mise en evidence de quelques lois de la thermodynamique des gaz et l'influence des divers paramètres des particules.



FONCTIONALITE

Manipulation des paramètres.
Simulation des particules.
Visualisation de quelques grandeurs.



PUBLIC VISE

Les étudiants et les enseignants de physique.



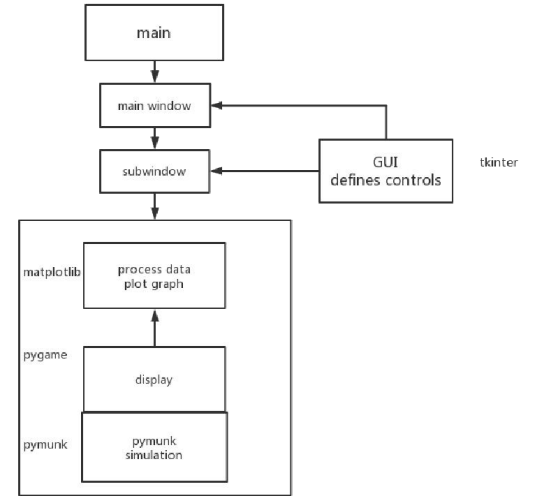
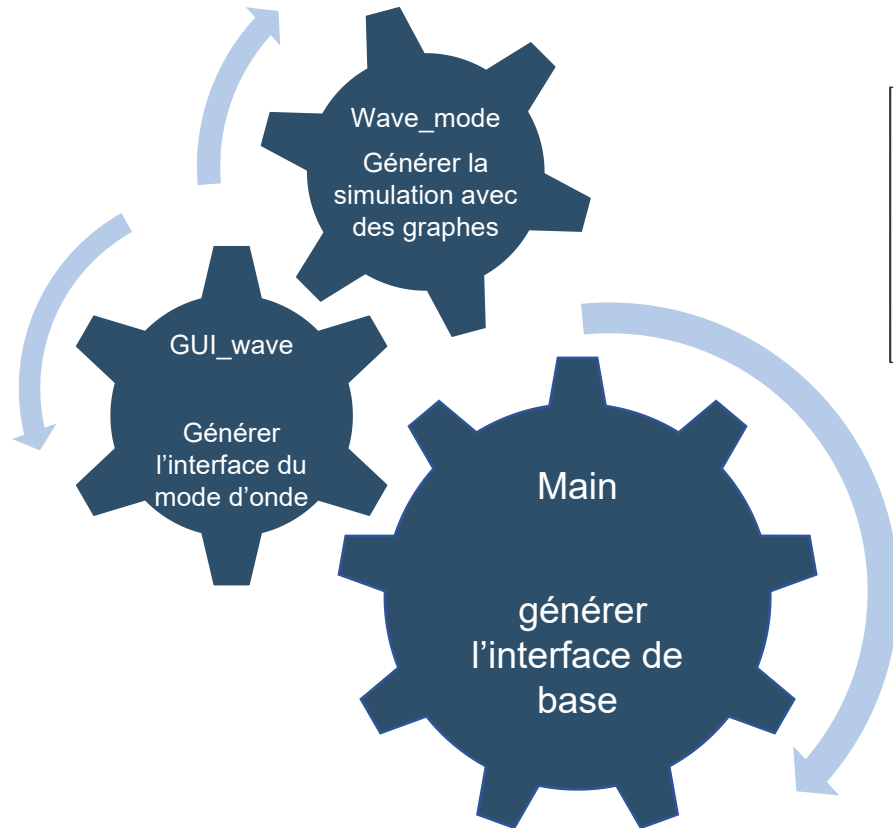
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STRUCTURE DU CODE

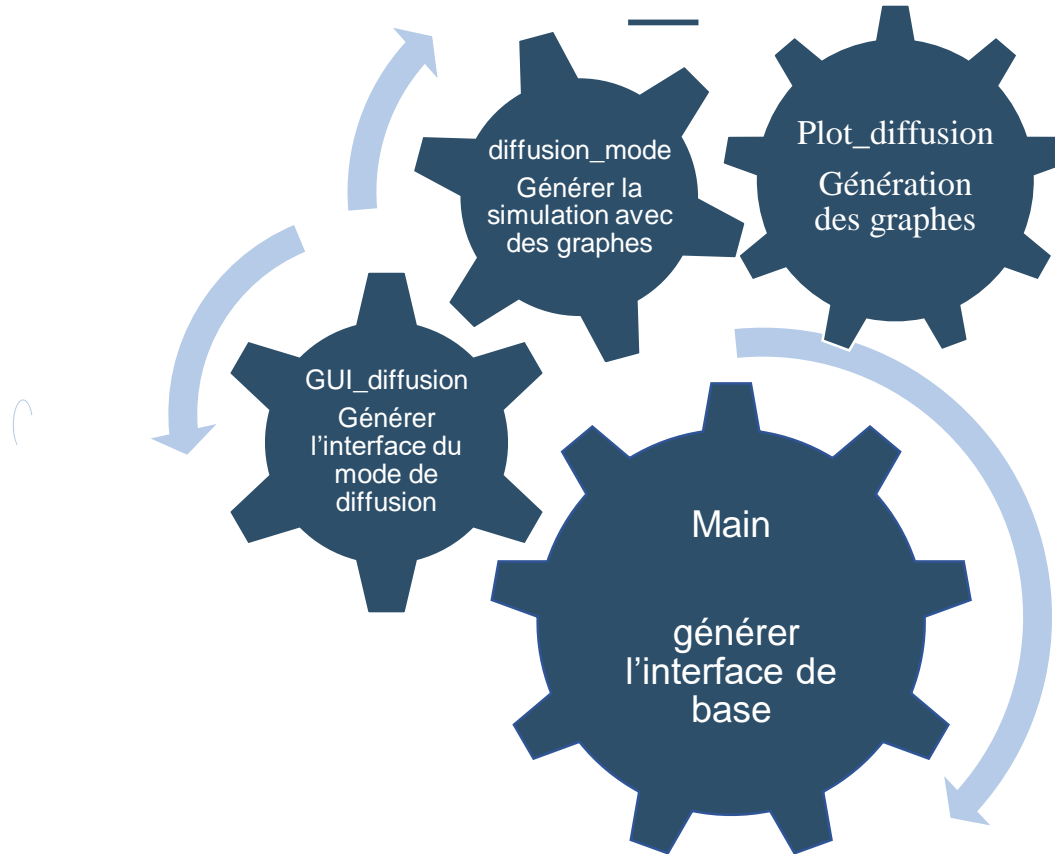


Notre code fait appel à deux modules principaux

Structure du code



Structure du code



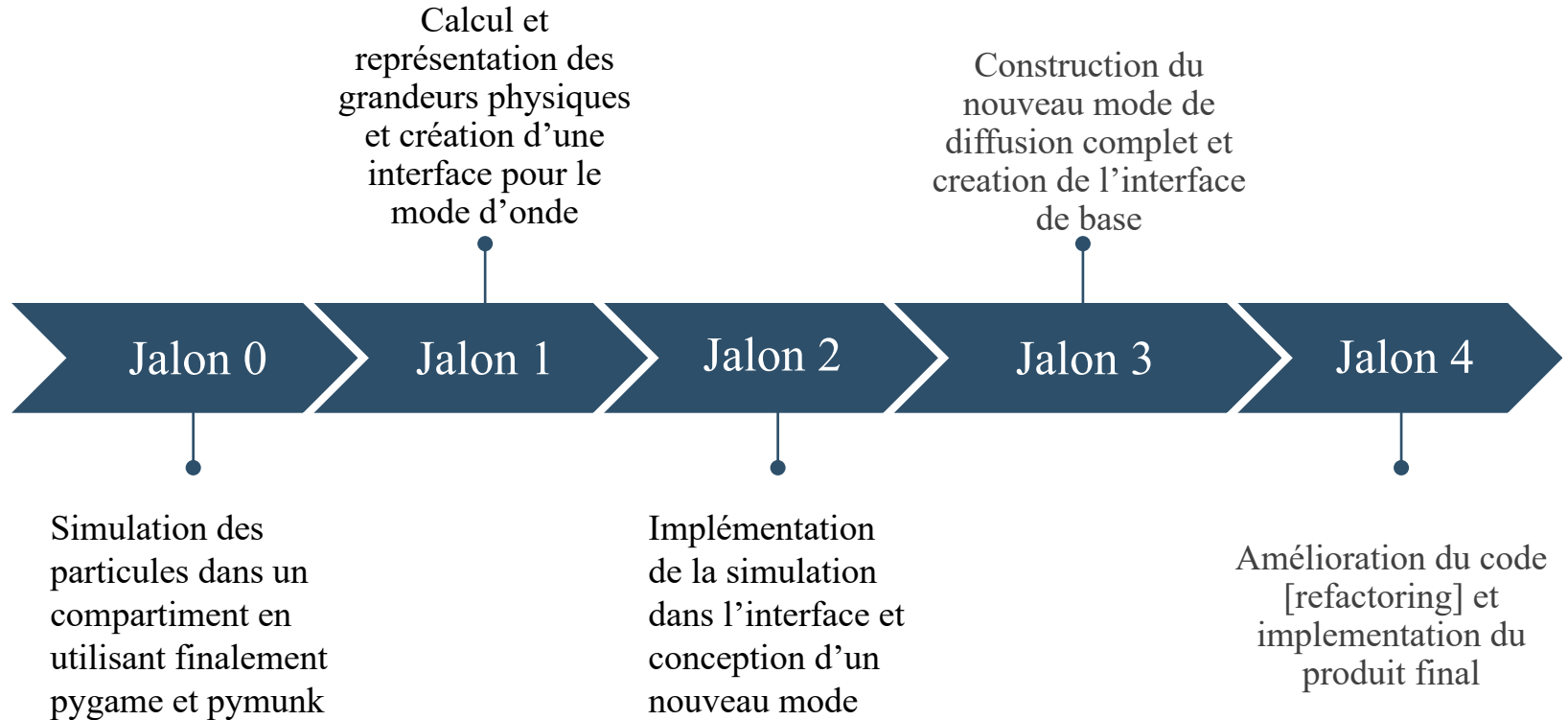


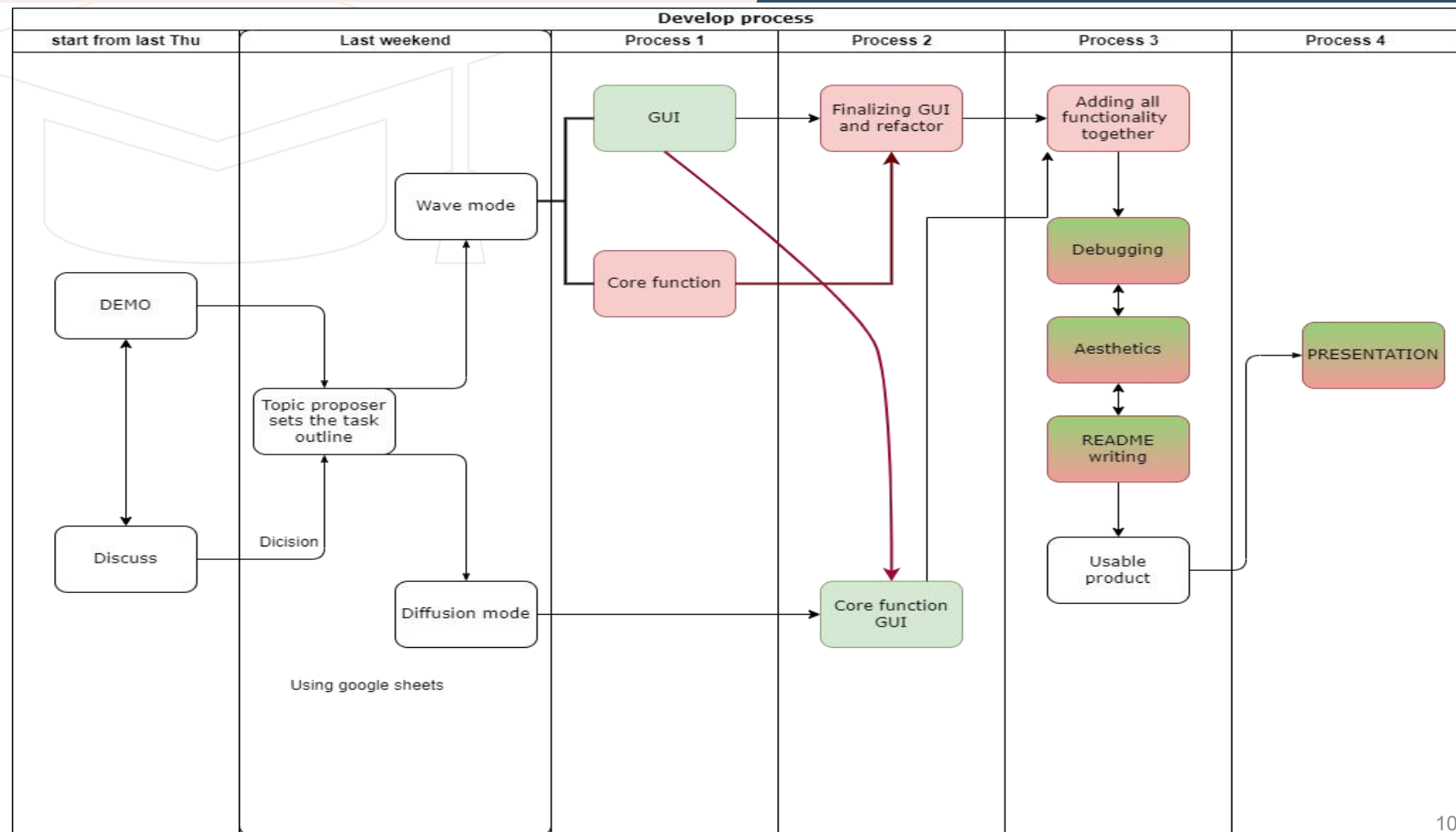
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REPARTITION DES TACHES

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Roadmap du développement





Répartition des tâches

Name of the feature	description	sub mission 1	executor	finished	sub mission 2	executor	finished	sub mission 3	executor	finished	sub mission 4	executor	finished
GUI	the graphical interface of the diffusion mode used to get the parameters and represent the graphical and statistical results	build interface (including a mode switch and other parametres)	Alae Taoudi, Ouchna, AFIF Mohamed Taha	finished	build functions associated with the button to change the parametres of the simulator	Alae Taoudi, Ouchna, AFIF Mohamed Taha	Quasi-finished	add some additional functions					
GUI 2	Refining GUI	Put the figures in the GUI panel	Bowen ZHU, Lezhi PU, Sida-Bastien LI	finished	adding sliders for control: num_of_ball, filter_rank, filter_freq, pusher_starttime, space_aspectratio	Bowen ZHU, Lezhi PU, Sida-Bastien LI	finished	refining GUI layout: specify figure size	Bowen ZHU, Lezhi PU, Sida-Bastien LI				
Velocity distribution and plot	collect the velocity of the particles and plot a live histogram	collect and update the velocity of the balls	Bowen ZHU	finished									
Density distribution and plot (wave mode only)	collect the distribution of the particles and plot a live histogram (1D)	mesh the area, and count the particles number in each unit	Lezhi PU, Sida-Bastien LI	finished	implement a plot function to draw the histogram	Bowen ZHU, Lezhi PU, Sida-Bastien LI	finished	collecting the wave speed	Bowen ZHU, Lezhi PU, Sida-Bastien LI	finished	optimising performance		
Calculate statistic numbers (temp, mean square speed pressure)	use some principles of physics to calculate the state of the gaz including the temperature, the mean square speed pressure	calculate the numbers	AFIF Mohamed Taha Sida LI	finished	verify its relationship compared to classic formula	AFIF Mohamed Taha	finished	Integrate the number onto game window or game control panel	Bowen ZHU	finished	adjust the results with the commercial software		
build another mode for example :diffusion	use the theory of molecular motion to construct a diffusion mode	discuss the details of the diffusion (1D or 2D)	Alae Taoudi, Ouchna, AFIF Mohamed Taha	finished	implement it	Alae Taoudi, Ouchna, AFIF Mohamed Taha		modify the GUI to accommodate it					
calculate diffusion rate	use the Maxwell's law of distribution to calculate the diffusion rate		Taha,Alae,Ouchna	finished									
vary the parameters and analyse the result.	change the parameters at GUI and then the results changee represent on GUI	Built a result saving system to save different results	Bowen ZHU Sida LI	finished	Vary the parameter and do multiple experiment	Bowen ZHU	finished	Compare the result to theoretic result	Bowen ZHU	finished			
play groundmode	allows you to place obstacles at will	discuss the details			implement it			modify the GUI to accommodate it					
refactor the code	divided the code into multiple modular modules	divided the code into multiple modular modules	Bowen ZHU	finished	optimising performance								
PPT	designe a pleasing PPT to show our work	designe a framework	Sida LI	finished	fill in the content	Sida LI, Alae Taoudi		shoot a video					



04

APPLICATIONS PARTICULIERES ET CONCLUSION



wave simulator

control panel

windows size: 300

pusher speed: 500

particle number: 4000

pusher start time: 38

pusher run time: 3

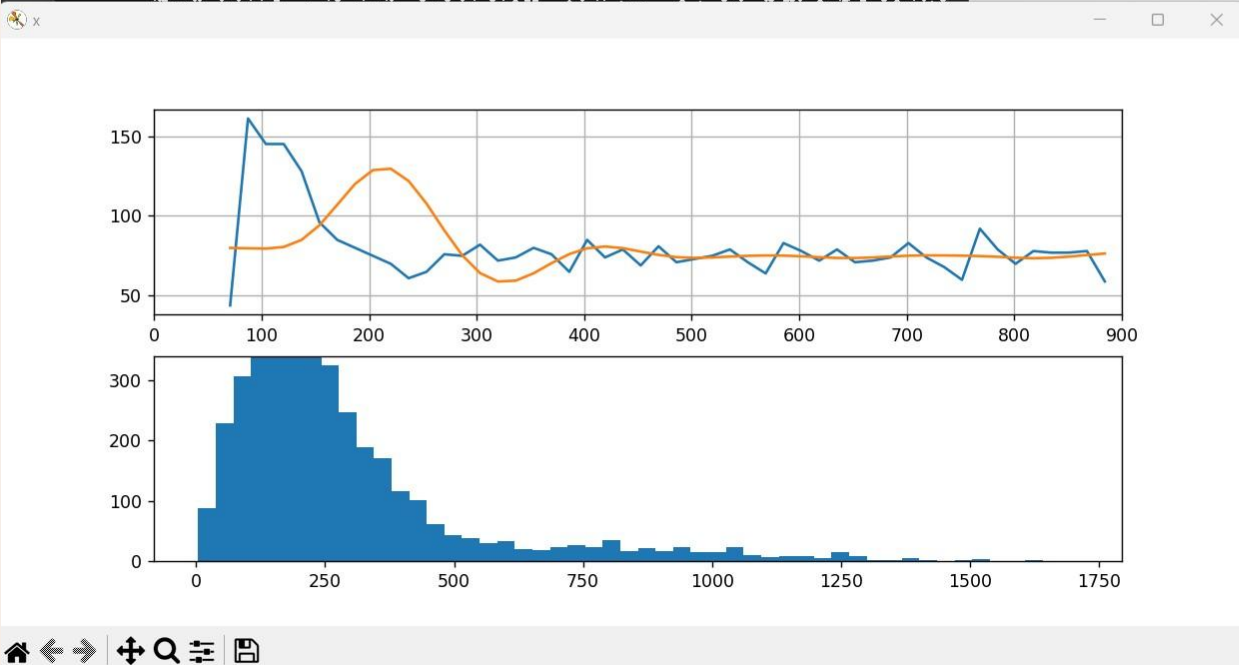
pusher elasticity: 1

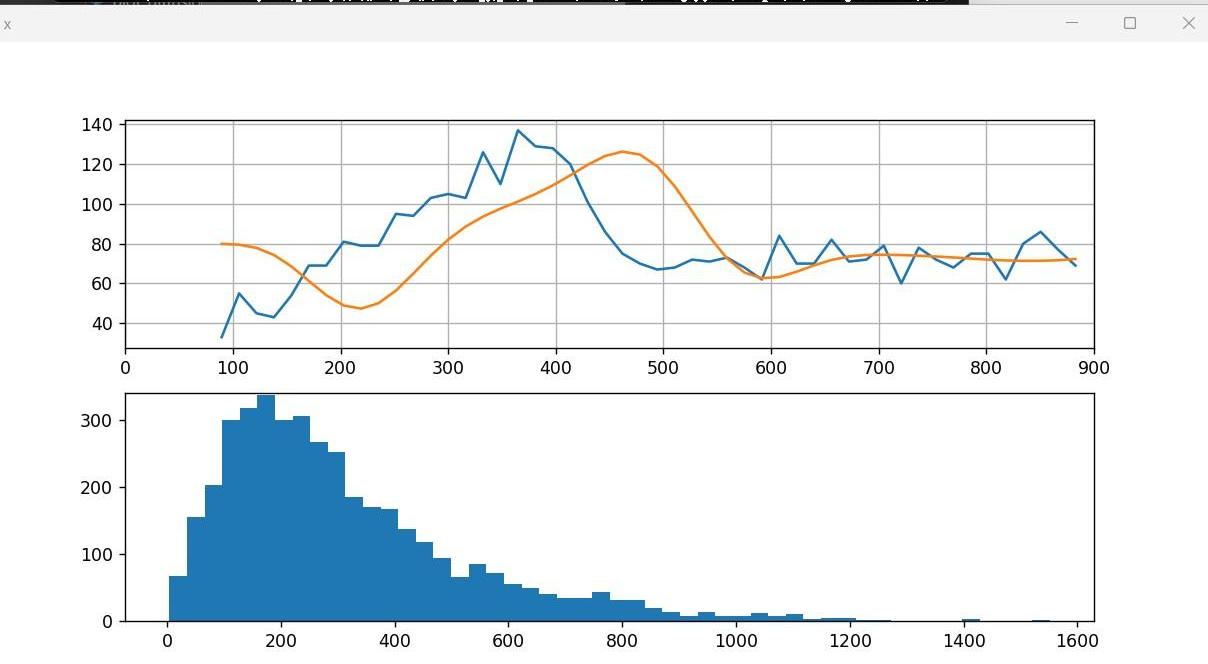
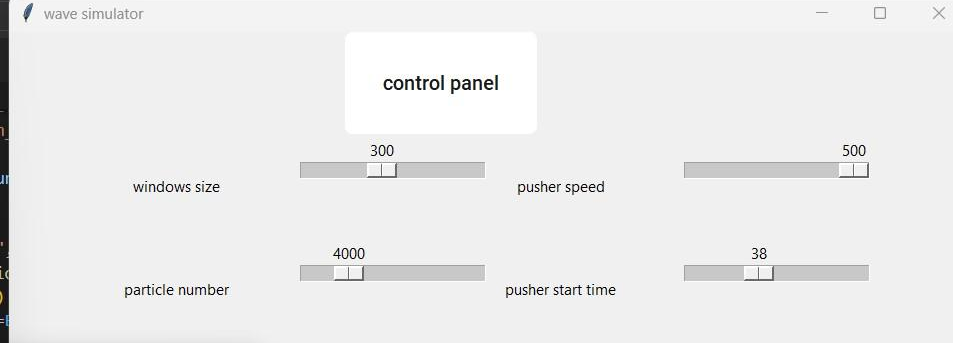
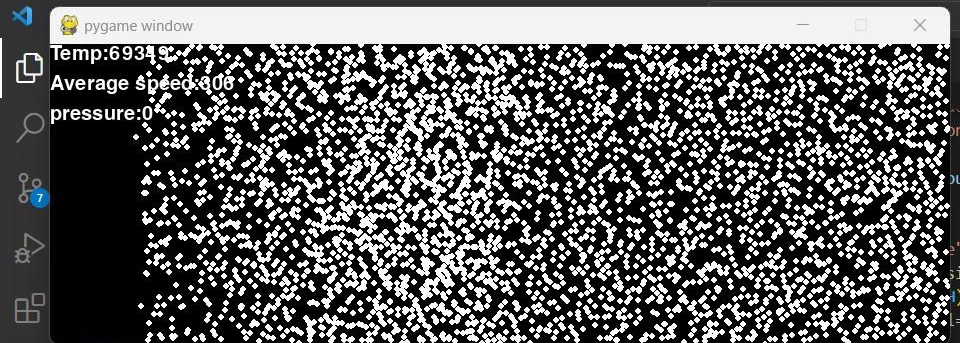
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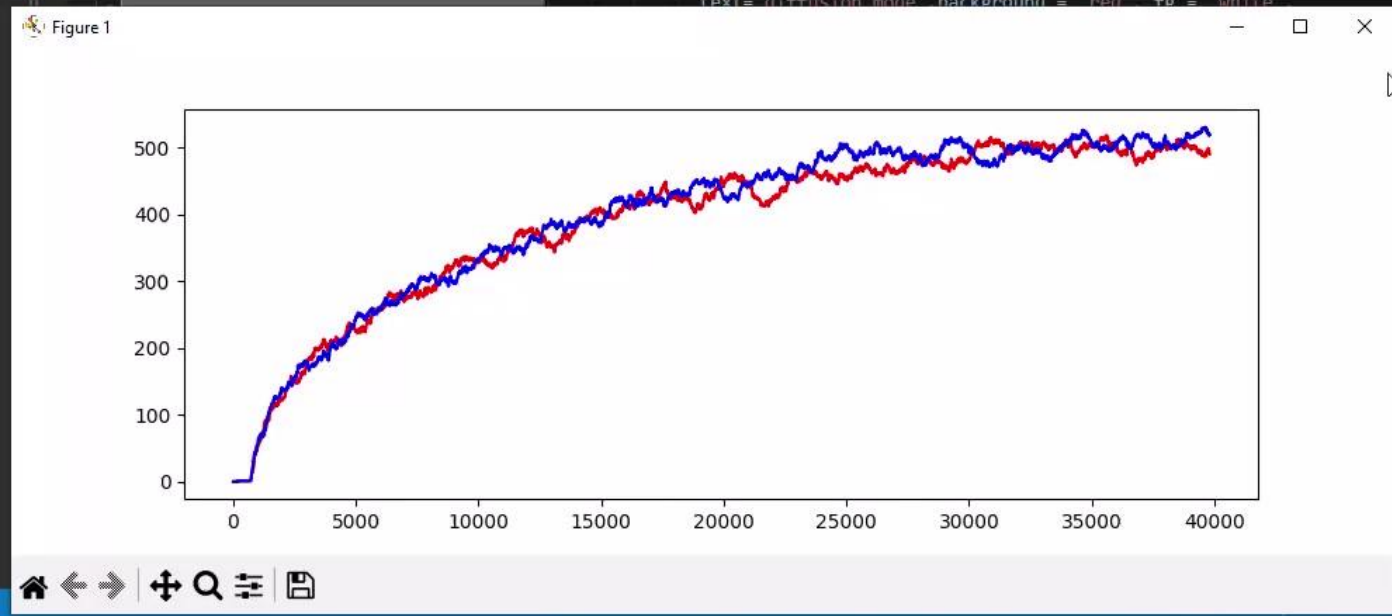
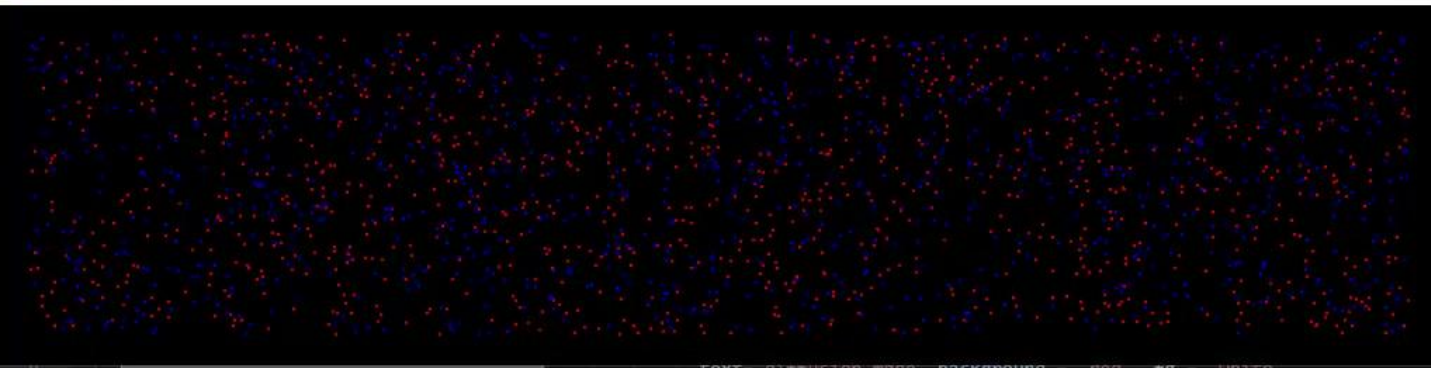
order of filter: 1.0

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Start







Control panel

Particle size

1

Particle size

1

Max speed

100

Max speed

100

Elasticity

1.00

Number of particles

1000

Number of particles

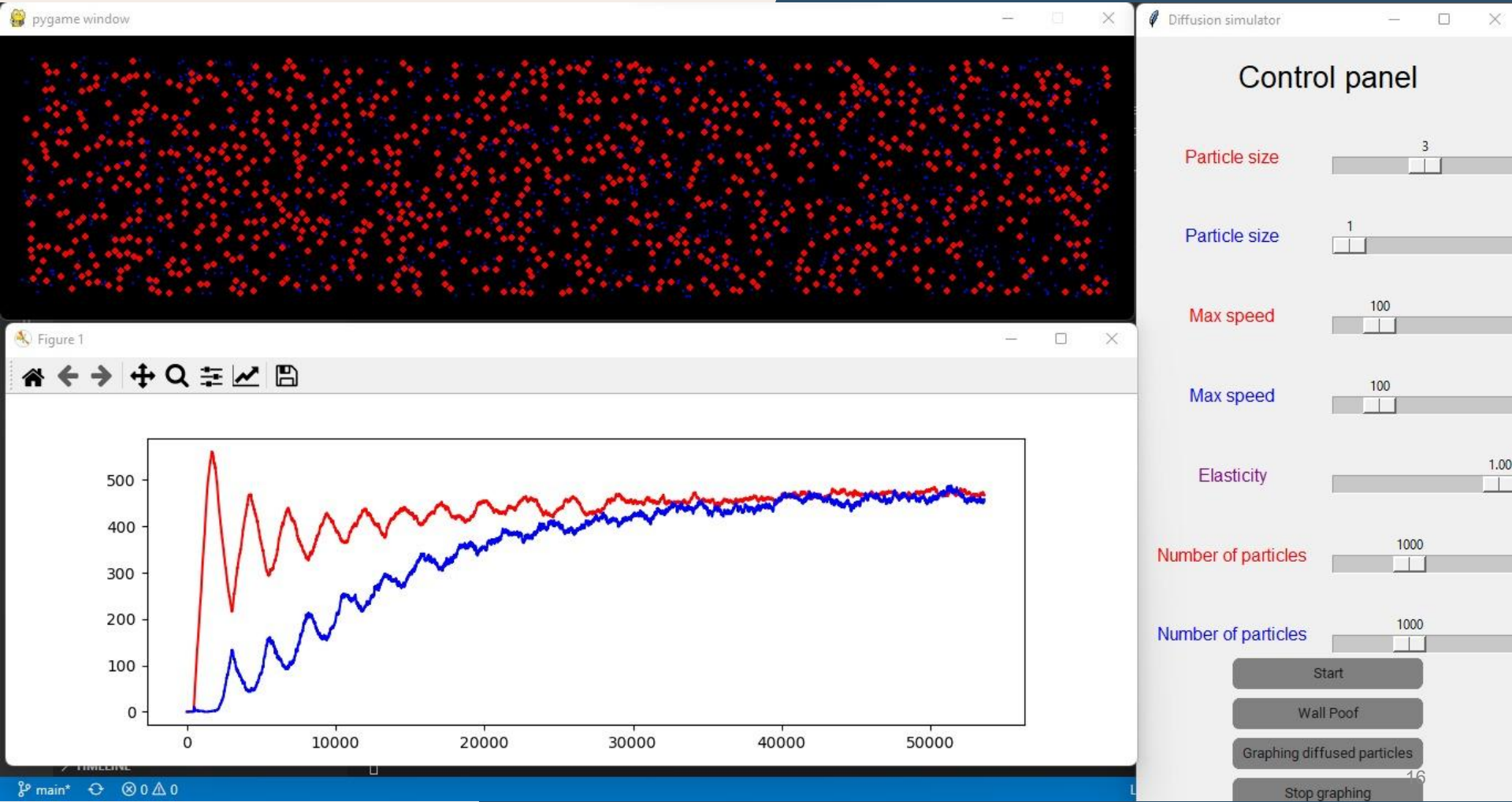
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Start

Wall Poof

Graphing diffused particles

Stop graphing





Avantages et inconvénients

Avantage 1

Notre produit final est facile à utiliser et il n'a pas besoin de l'internet pour fonctionner.

Avantage 2

Notre code est assez modulaire et intuitif ce qui facilite sa modification pour futurs améliorations

Inconvénient 1

Notre programme n'est pas intégré en une seule fenêtre.

Inconvénient 2

L'exécution de notre code occupe une partie importante de la mémoire.

Conclusion

Ce produit final n'est pas complet, on peut toujours ajouter des nouvelles fonctionnalités mais il reste un bon outil éducatif permettant d'analyser quelques phénomènes physiques liées aux interactions des particules. ◦

M E R C I

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