



# Pybots Tournament



Monday October 30th



# Program

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## Schedule:

- 15:00 - 15:30: Game presentation
- 15:30 - 18:00: Work individually or in teams on your Pybot
- 18:00: Food!
- 18:00 - 19:30: Tournament!

## How we run this event:

- Have fun with the challenge
- It is (most probably) possible to cheat, please show good sportsmanship

**SUPREMACY**

# Supremacy





# Supremacy

The year is 8062.

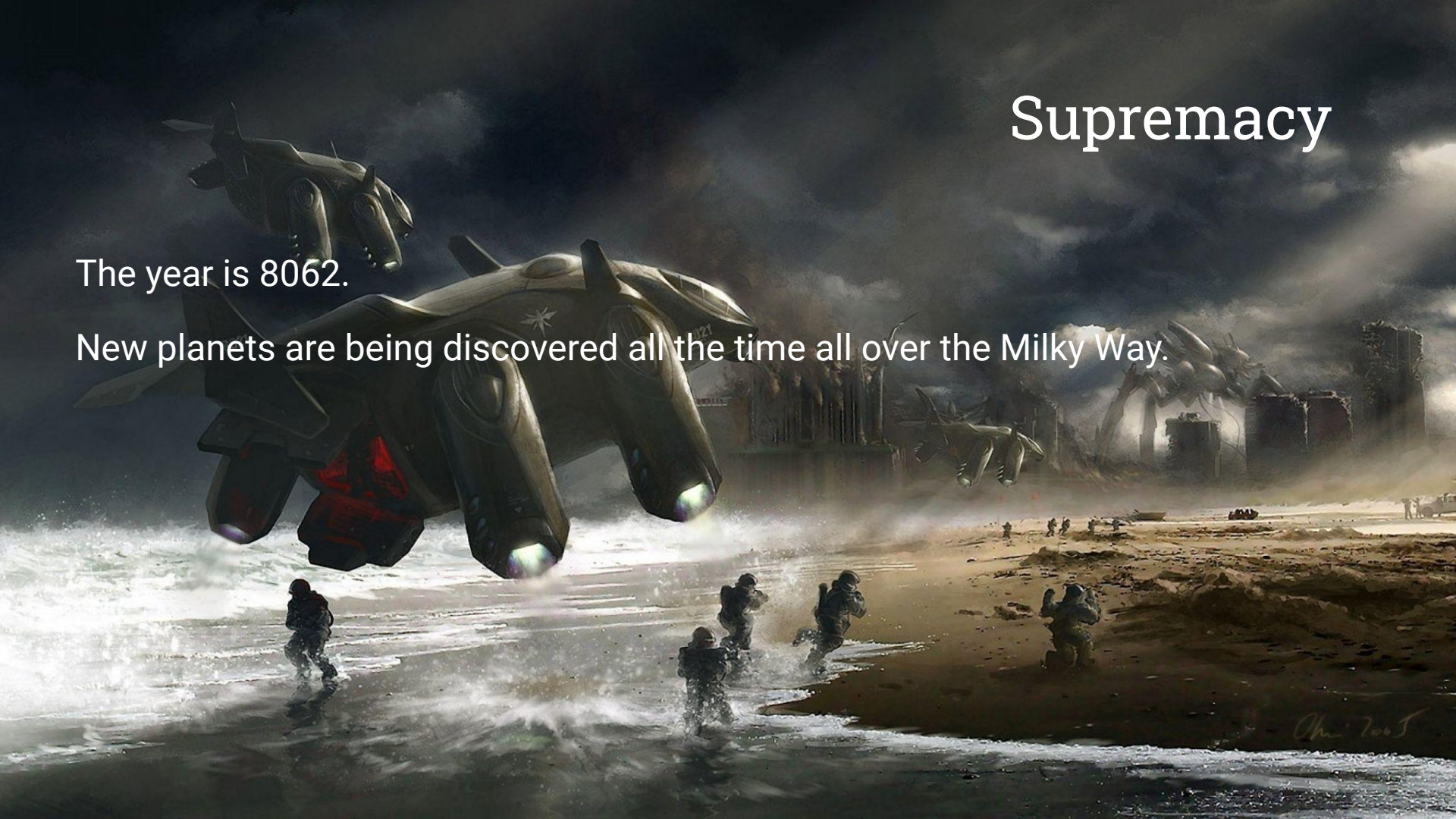




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New planets are being discovered all the time all over the Milky Way.





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Forget oil, forget fusion reactors, humans discovered Crystal in the year 3559.

This changed our universe forever...





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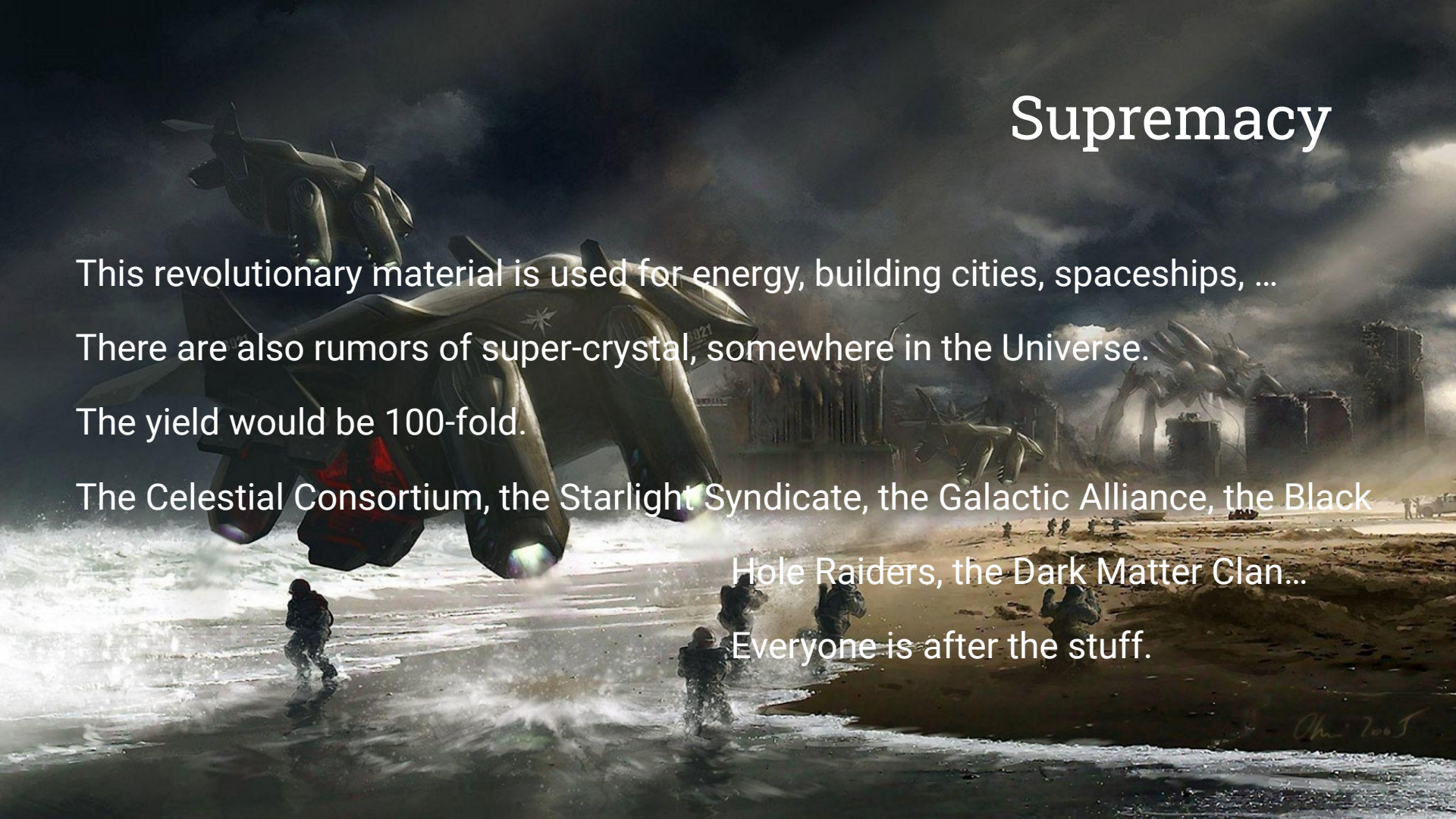
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The Celestial Consortium, the Starlight Syndicate, the Galactic Alliance, the Black

Hole Raiders, the Dark Matter Clan...

Everyone is after the stuff.





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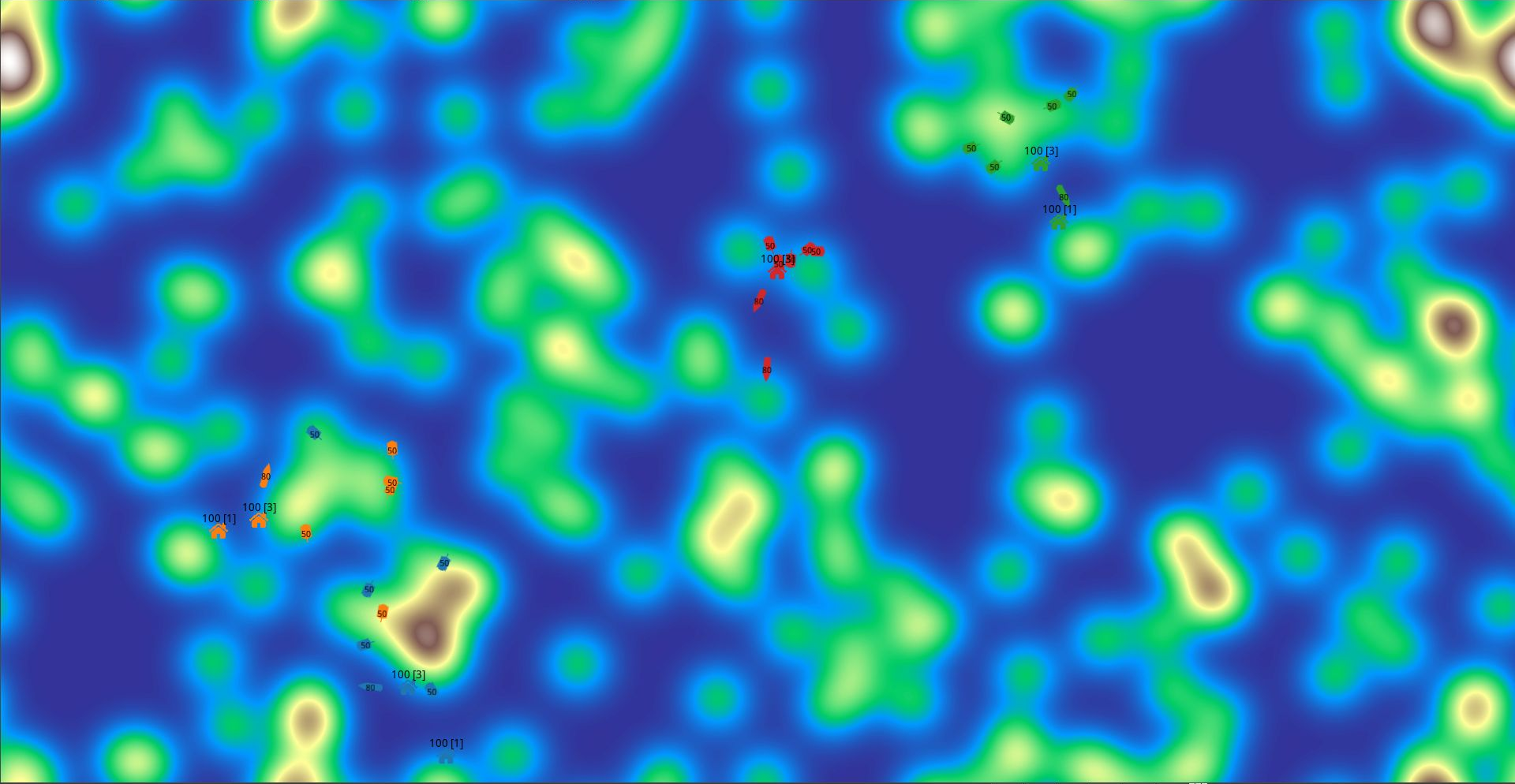
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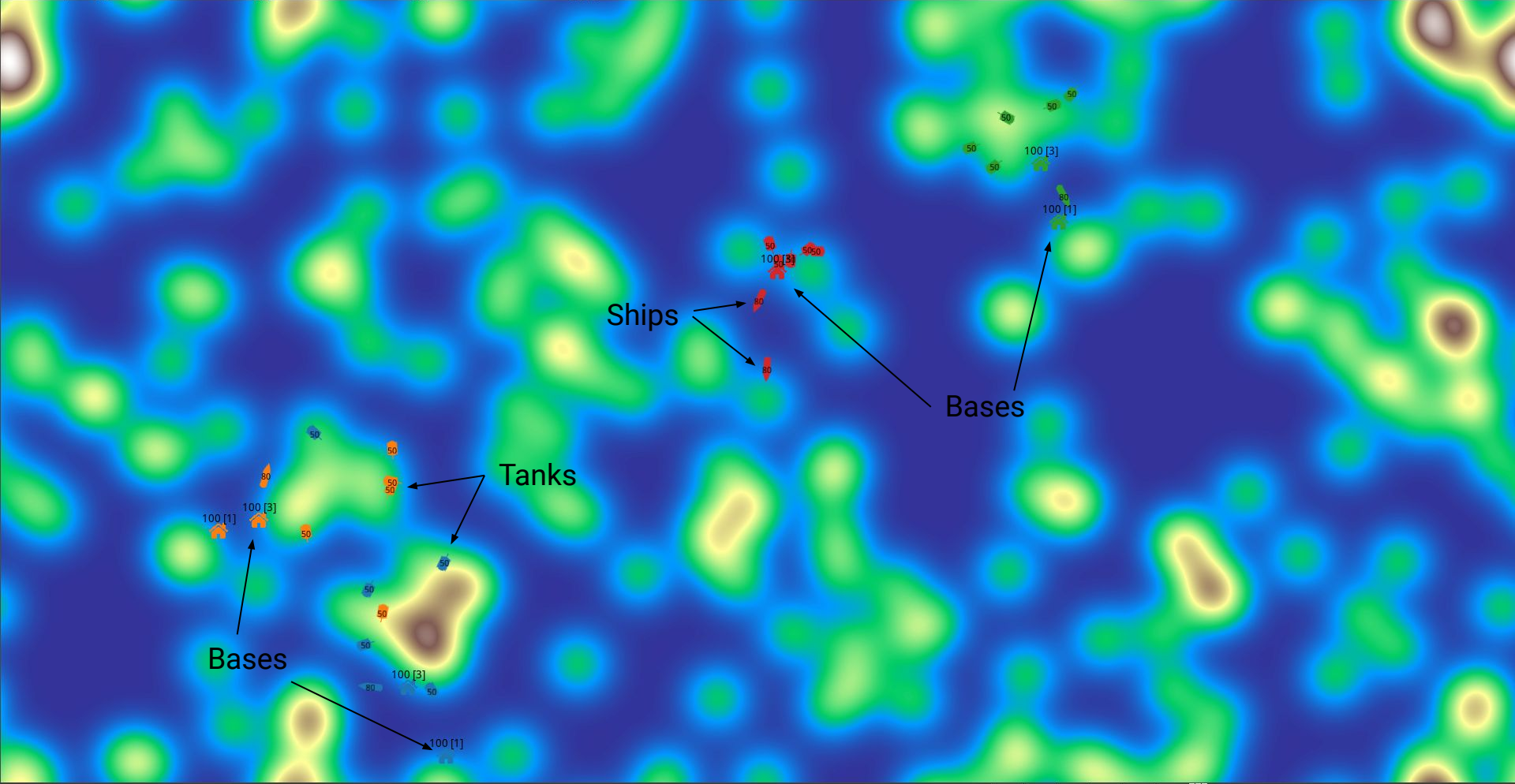
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Good luck!

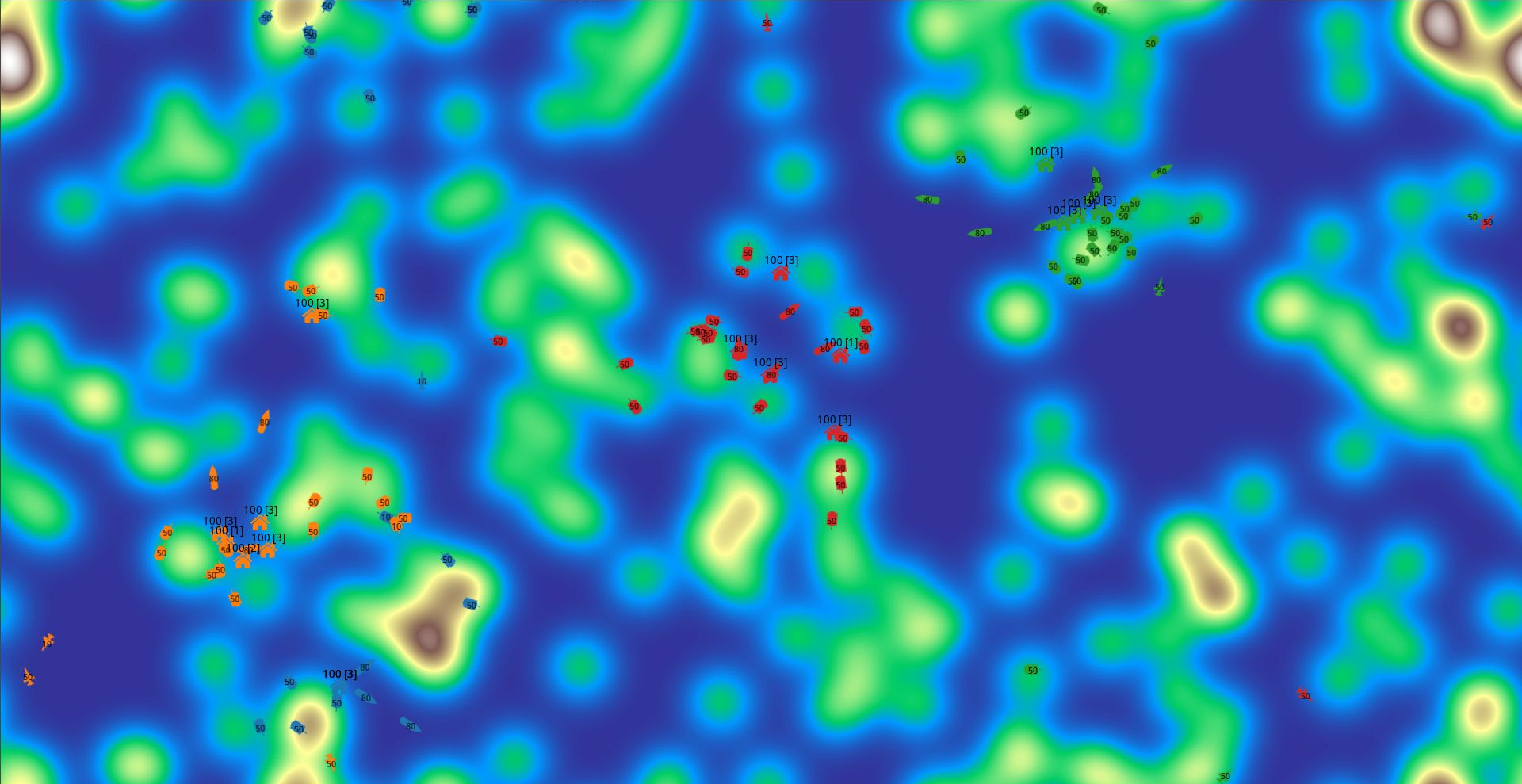
*Chris 2005*















# Game rules (1/3)

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## Goal:

- Mine resources to build and army
- Destroy enemy bases and eliminate other players
- All players play on the map at the same time
- Each round lasts 8 minutes

## Game map:

- Dimensions: variable: more players = larger map
- Coordinate system: lower left =  $(0, 0)$ , upper right =  $(nx, ny)$
- Auto-generated every round, with periodic boundary conditions





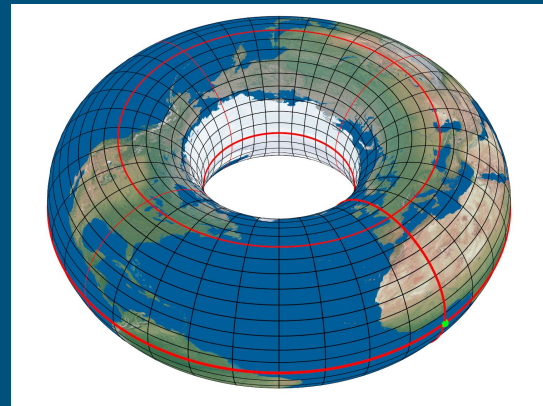
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# Game rules (2/3)

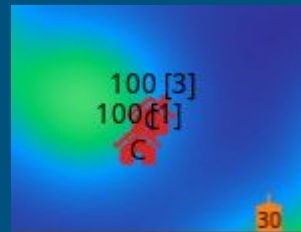
## Mining

- Everyone starts with 1 base, housing 1 mine
- Every timestep, each mine will extract  $\text{crystal} = 2 * \text{number\_of\_mines}$
- Crystal is used to build mines and vehicles
- Mines too close to other mines compete for resources:

$$\text{crystal} = 2 * \text{number\_of\_mines} / \text{number\_of\_bases\_inside\_square\_of\_80px}$$

## Fights

- Whenever two or more vehicles or bases from opposing teams come within 5px from each other, they will fight
- Every object hits all the others with its attack force, and it takes damage from all other objects
- Fights are resolved (almost) instantly (in a single time step)





# Vehicles



	Tank	Ship	Jet
Speed	10	5	20
Attack	20	10	30
Health	50	200	50
Cost	500	2000	4000
Can travel	On land	On sea	Anywhere
		Turns into base	

# Game rules (3/3)

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- Mine cost is  $\times 2$  for every new mine on a given base (first mine = 1000)
- Base has health = 100, mine has health = 50 (both have 0 attack)
- Vehicles move at  $\text{speed} * dt$  ( $dt = 1/15s$ )
- A ship can be turned into a new base, by calling `convert_to_base()`
- Only works if there is land in the immediate vicinity
- If a player dies, all his/her vehicles disappear instantly

## Scoring

- 1 point if you destroy a base
- If a player dies, gets a number of points equal to the number of dead players
- At the end of the round, every player still alive gets points equal to the number of dead players

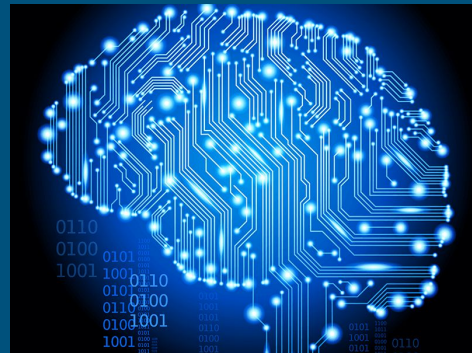


# Demo!

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# The control center - the AI (1/3)

---



## Info (dict) it received every timestep

- One entry per player (including yourself)
- Inside each entry, a list of **'bases'**, **'tanks'**, **'ships'**, and **'jets'**

### Base info

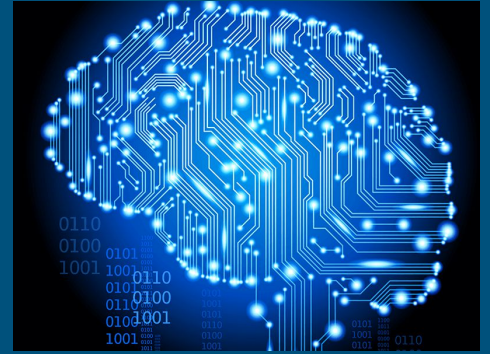
- **.x**: x position
- **.y**: y position
- **.team**: e.g. **'John'**
- **.number**: player number
- **.mines**: number of mines
- **.crystal**: amount of crystal
- **.uid**: unique id

### Vehicle info

- **.x**: x position
- **.y**: y position
- **.team**: e.g. **'John'**
- **.number**: player number
- **.speed**, **.health**, **.attack**, **.stopped**
- **.heading**, **.vector**, **.position**
- **.uid**: unique id



# The control center - the AI (2/3)

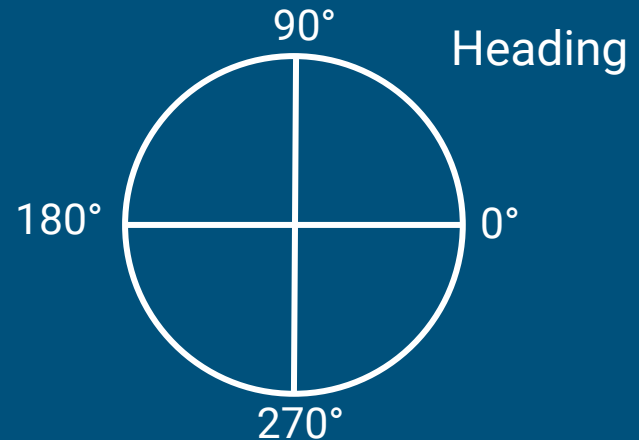


## Base methods

- `cost('mine')`: get the cost of an object
- `build_mine()`, `build_tank()`, `build_ship()`, `build_jet()`

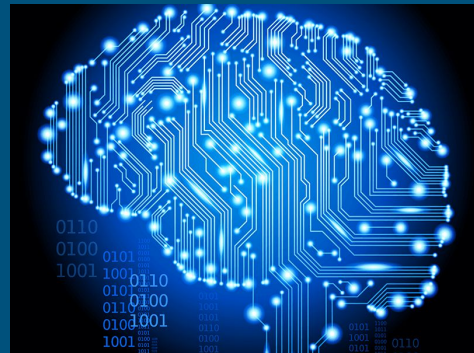
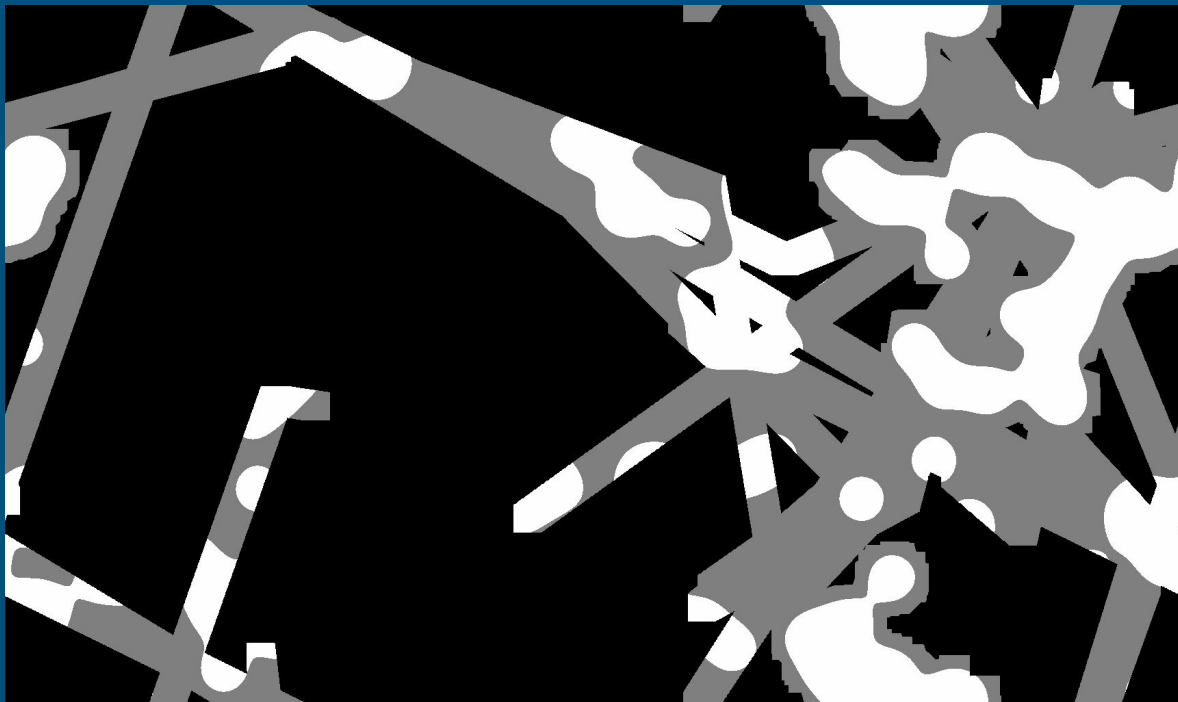
## Vehicle methods

- `get_position()`: returns `np.array([x, y])`
- `get_heading()`: returns angle in degrees
- `set_heading(angle_in_deg)`
- `get_vector()`: returns `np.array([vx, vy])`
- `set_vector(np.array([vx, vy]))`
- `goto(x, y)`
- `stop()`, `start()`
- `get_distance(x, y)`
- `convert_to_base()`



# The control center - the AI (3/3)

The game map is filled in for you!



- 0 = sea
- 1 = land
- -1 = no info



# Template bot

---

```

3 import numpy as np
4
5 from supremacy import helpers
6
7 # This is your team name
8 CREATOR = "SimpleAI"
9
10 def tank_ai(tank, info, game_map):
11     """
12     Function to control tanks.
13     """
14     if not tank.stopped:
15         if tank.stuck:
16             tank.set_heading(np.random.random() * 360.0)
17         elif "target" in info:
18             tank.goto(*info["target"])
19
20
21
22 def ship_ai(ship, info, game_map):
23     """
24     Function to control ships.
25     """
26     if not ship.stopped:
27         if ship.stuck:
28             if ship.get_distance(ship.owner.x, ship.owner.y) > 20:
29                 ship.convert_to_base()
30             else:
31                 ship.set_heading(np.random.random() * 360.0)
32
33
34 def jet_ai(jet, info, game_map):
35     """
36     Function to control jets.
37     """
38     if "target" in info:
39         jet.goto(*info["target"])
40
41
42
43

```

```

44
45 class PlayerAi:
46     """
47     This is the AI bot that will be instantiated for the competition.
48     """
49
50
51
52     def __init__(self):
53         self.team = CREATOR # Mandatory attribute
54         self.build_queue = helpers.BuildQueue(
55             ["mine", "tank", "ship", "jet"], cycle=True
56         )
57
58     def run(self, t: float, dt: float, info: dict, game_map: np.ndarray):
59         """
60         This is the main function that will be called by the game engine.
61         """
62
63         # Get information about my team
64         myinfo = info[self.team]
65
66         # Iterate through all my bases and process build queue
67         for base in myinfo["bases"]:
68             # Calling the build_queue will return the object that was built by the base.
69             # It will return None if the base did not have enough resources to build.
70             obj = self.build_queue(base)
71
72         # Try to find an enemy target
73         # If there are multiple teams in the info, find the first team that is not mine
74         if len(info) > 1:
75             for name in info:
76                 if name != self.team:
77                     # Target only bases
78                     if "bases" in info[name]:
79                         # Simply target the first base
80                         t = info[name]["bases"][0]
81                         myinfo["target"] = [t.x, t.y]
82                         break
83
84         # Control all my vehicles
85         helpers.control_vehicles(
86             info=myinfo, game_map=game_map, tank=tank_ai, ship=ship_ai, jet=jet_ai
87         )

```

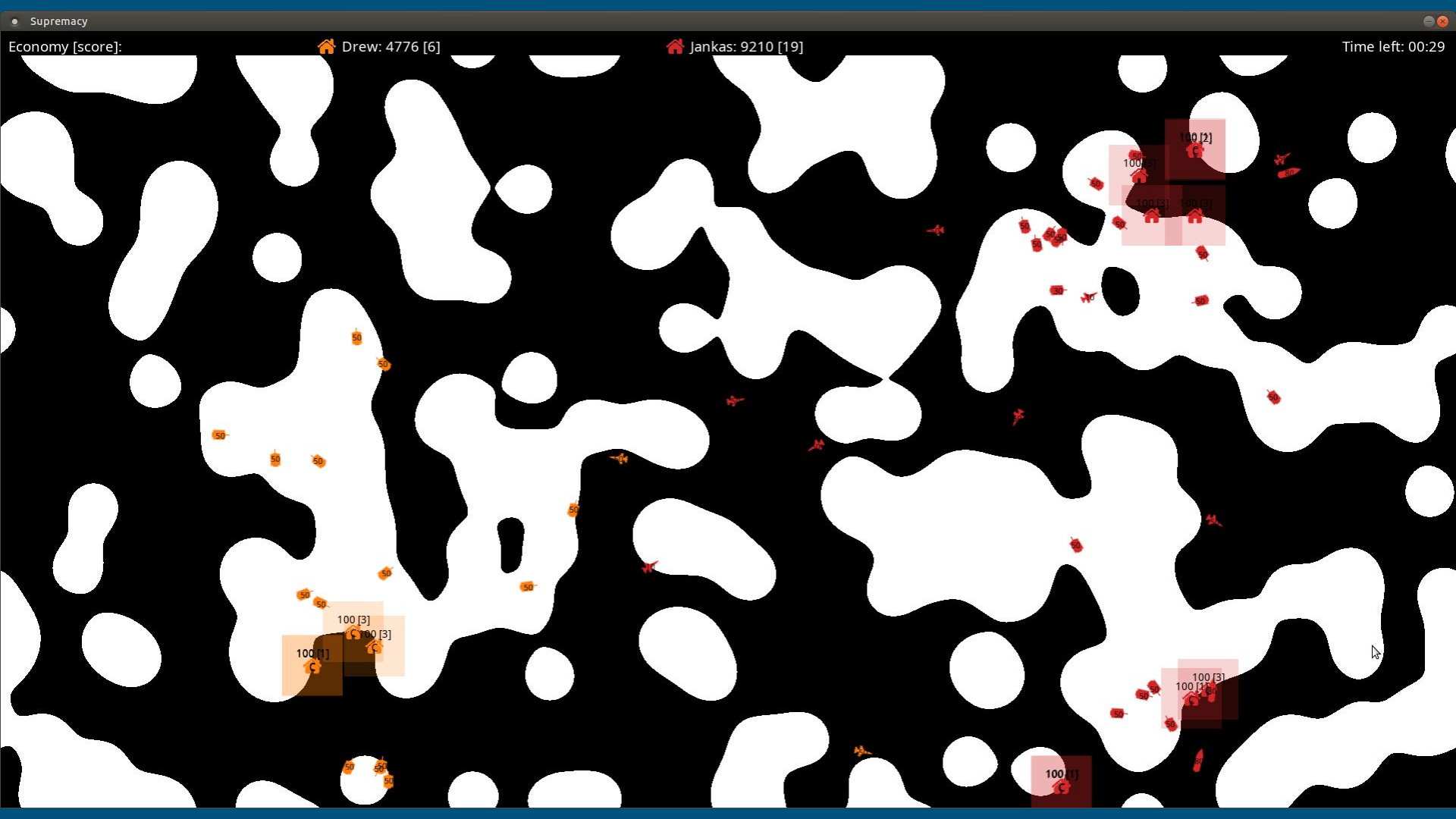


# Optimizing development

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## 1. The 'high contrast' mode

Activate with `high_contrast=True`





# Optimizing development

---

## 2. Crystal boost:

Artificially increase mine yield using `crystal_boost=2`

# Optimizing development

---

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## 3. Use The 'Pause' Luke (experimental):

While the game is running, you can hit  on the keyboard.

This will pause the game. You can edit your AI code.

When the game resumes (hit  again), it will reload your AI module.



# What's next

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## Get started

- Install game from <https://github.com/nvaytet/supremacy>
- Start coding!
- I have my own simple bot: dare to challenge it?

## Tournament

- 6 rounds of 8 minutes (15 min hacking allowed at half-time?)
- Alliances are allowed (betrayals are also allowed!)
- Hopefully, every round will end up in a giant mess!

<https://github.com/nvaytet/supremacy>

---

```
conda create -n <NAME> -c conda-forge python=3.10
```

```
conda activate <NAME>
```

```
git clone https://github.com/nvaytet/supremacy.git
```

```
cd supremacy/
```

```
python -m pip install -e .
```

```
cd tests/
```

```
python test.py
```