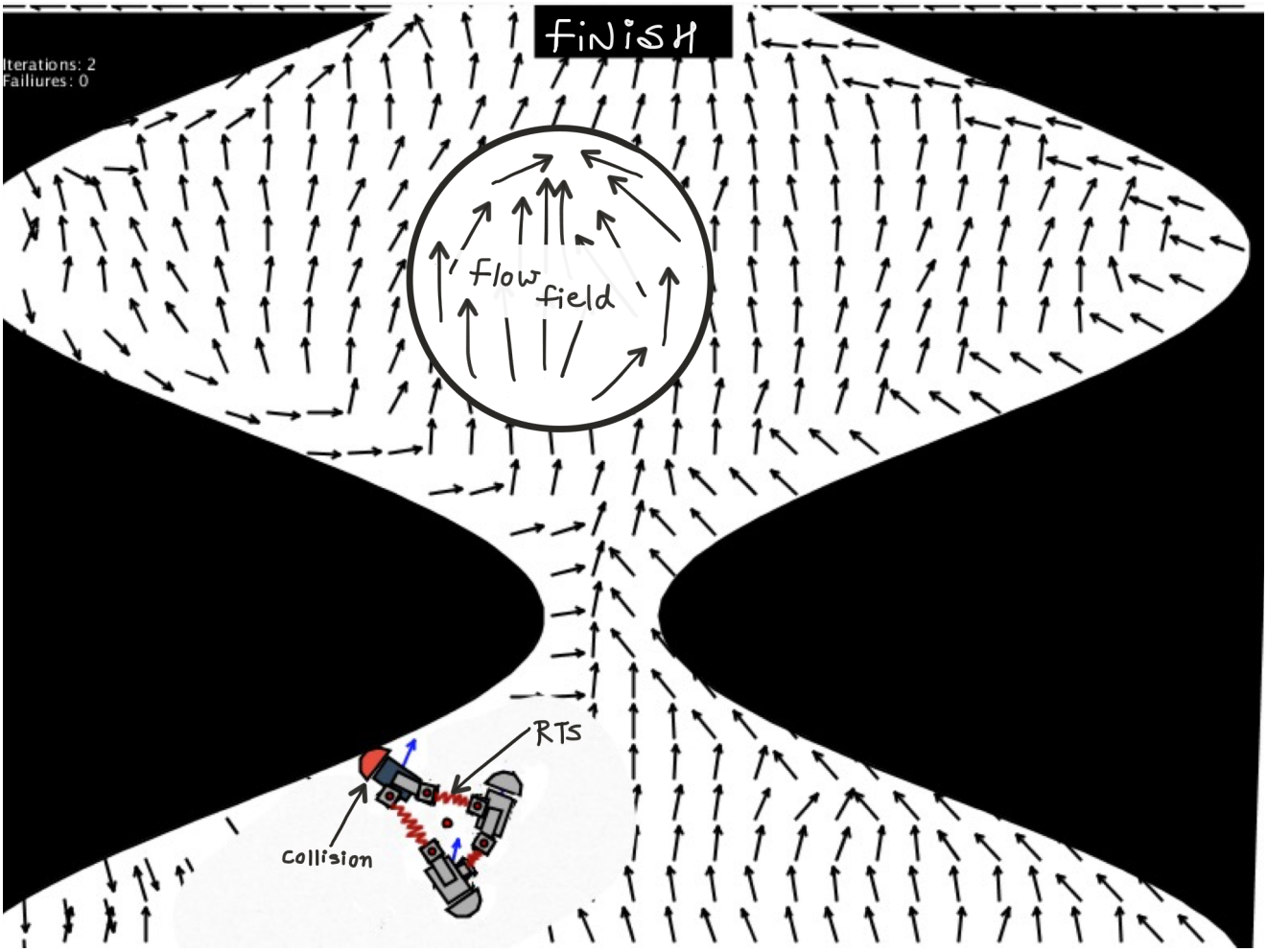


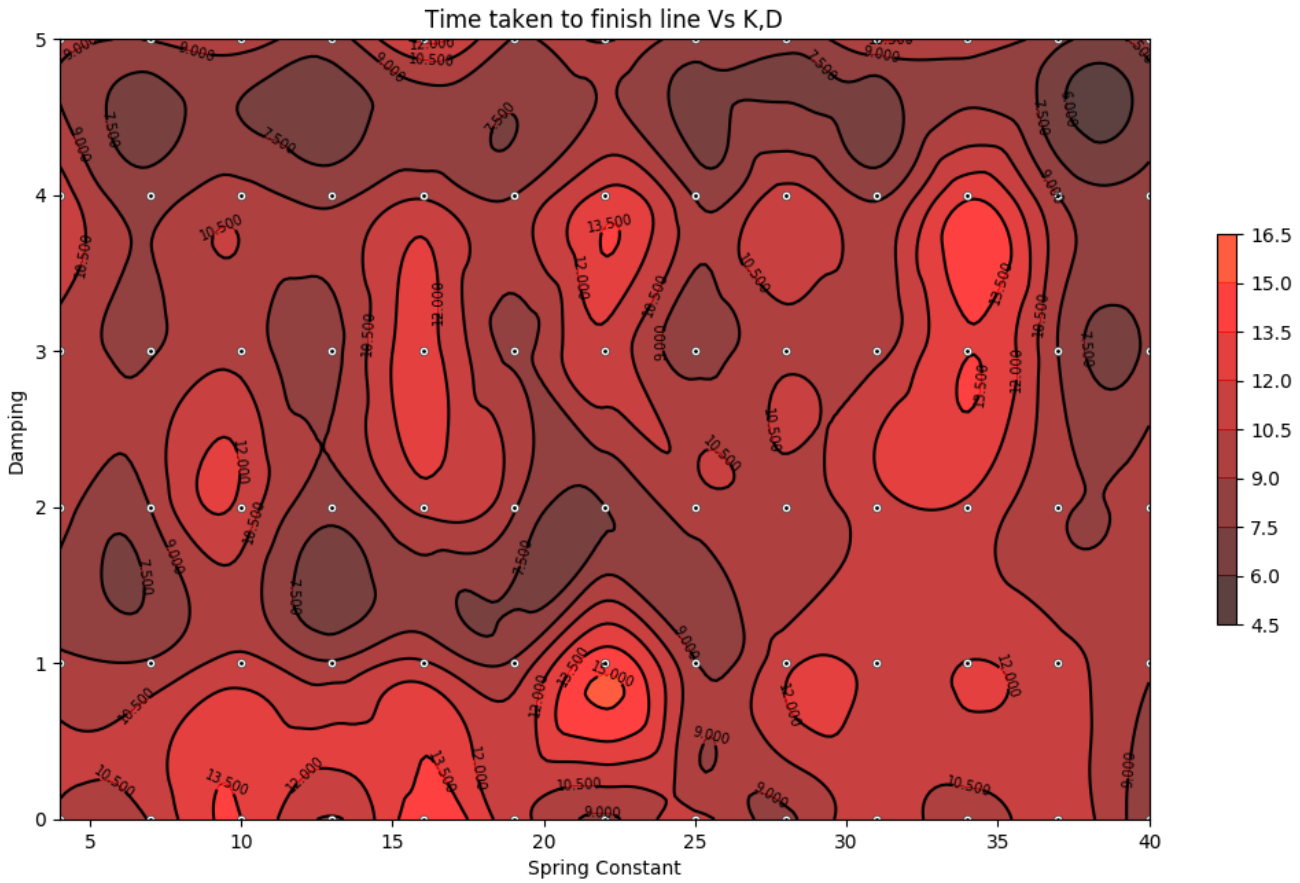
1. I made a simulation in which each of these bots is connected through springs. When a bot collides (the colored), it measures the force of the collision and then adjusts the resting length of the spring by winding it such that it absorbs the collision force and moves away from the wall. Thus, the spring is tuned in real time (RTS).
2. When spring is winded, the red bot is pulled away from the wall as the mass of others is greater.
   This is the only logic behind it. I will this system as "reactive" in the text below.

Next, I wanted to see how the initial properties of springs affect the reactive system. To do this, I varied the spring constant and damping ratio and compared it with a completely identical twin but which does not have collision detection (I will call this a passive system). The comparison was based on two things.

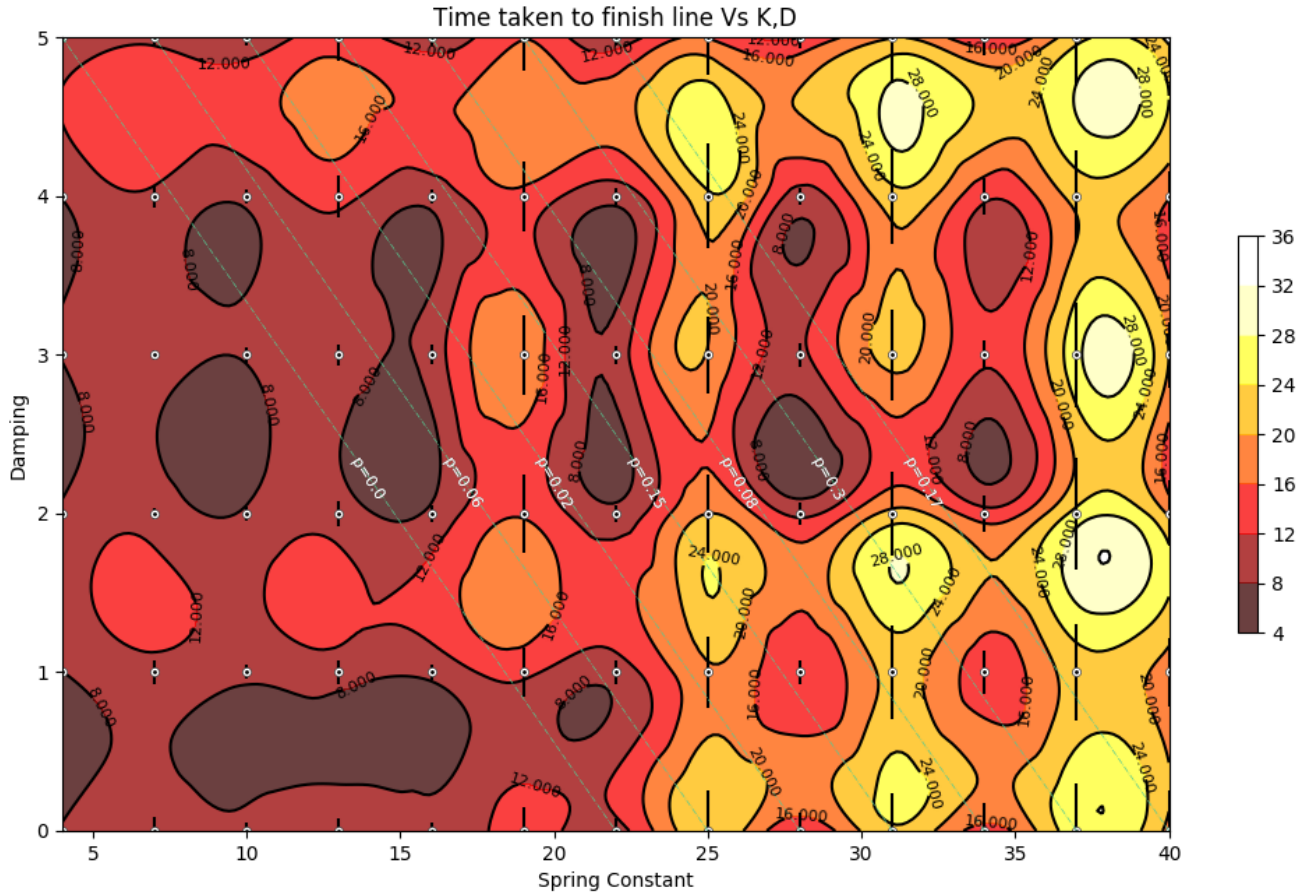
```
  1. The time it took for both the systems to cross the finish marker.
  2. The number of failures occurred during 150 iterations for every KD pair; for both systems.
The system not being able to cross the finish mark within 60 seconds was considered to be a
failiure.
```

Following are the results

1. 1. As shown in the figure below, the reactive system takes 4.5-16.5 seconds for any given KD pair. With no observed failures.



2. On the other hand, the passive system takes 4-36 seconds and has failure probability $p \geq 0.06$ seconds.



This means that the reactive system outperforms a passive system for $k \geq 6.528$.