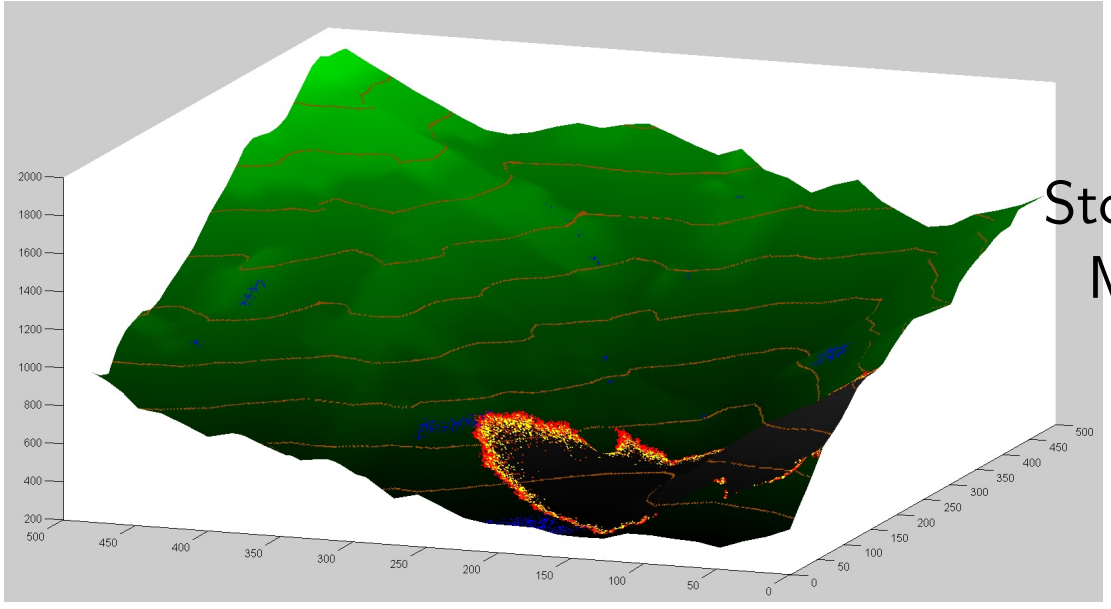
Fire propagation



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ETHZ HS 13

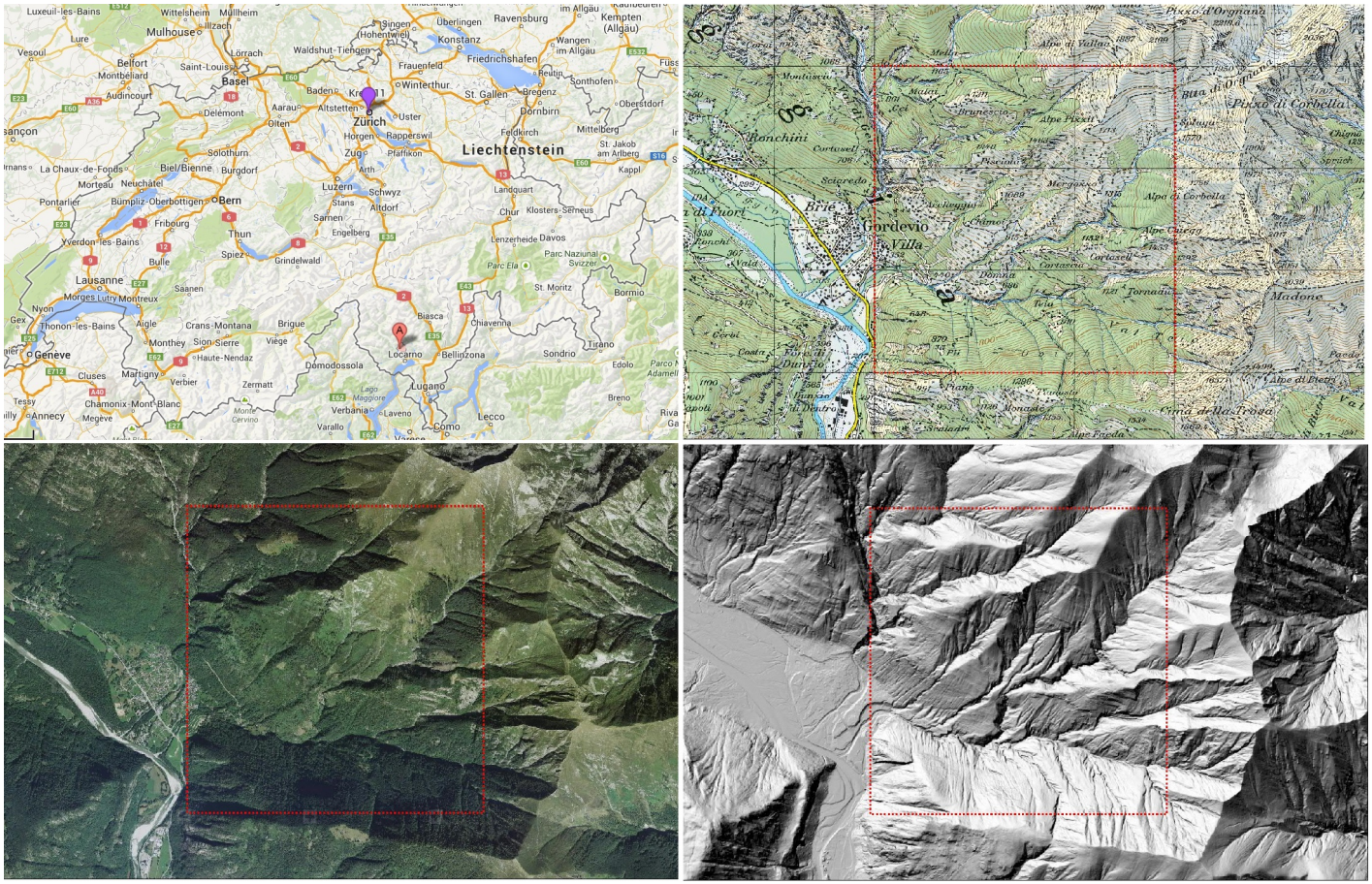
Contents

Introduction and purpose

- Model a 3D section of a forest
- Implement wind with direction and intensity
- Implement farmhouses present in the forest
- Study the propagation of the fire, starting from one point
- Realistic propagation (wind and ground of the forest) on a real forest
- Predict propagation

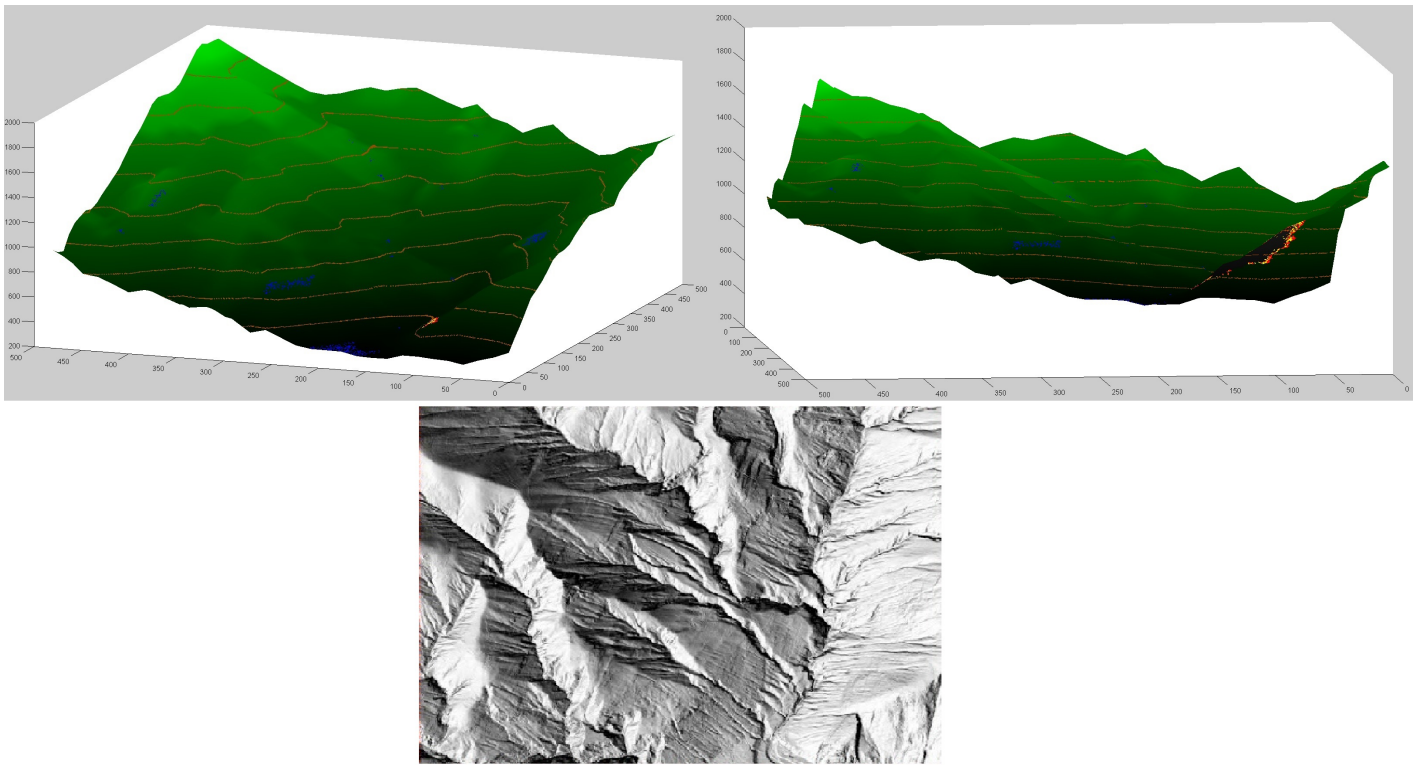
Real forest and data

Gordevio (Ticino) a region were there was a fire propagation some years ago.

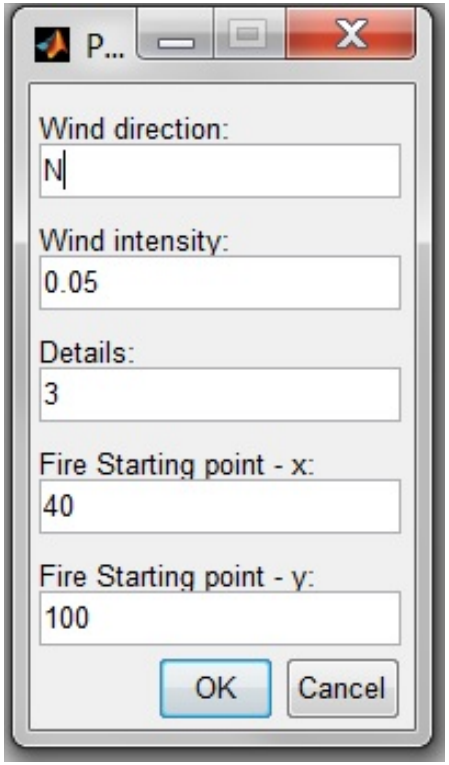


Real forest and data

Implement the forest: matrix with hight for every region of the forest.



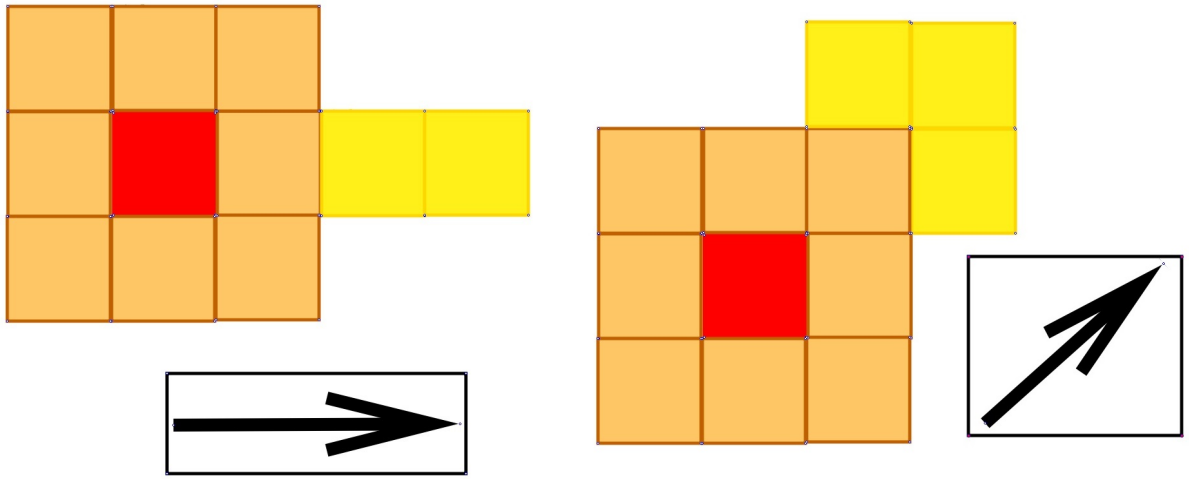
Program



- Import information about forest (hight matrix and density matrix)
- values 0-7 for every cell. Burning: 1-6, burned 7, not burning 0

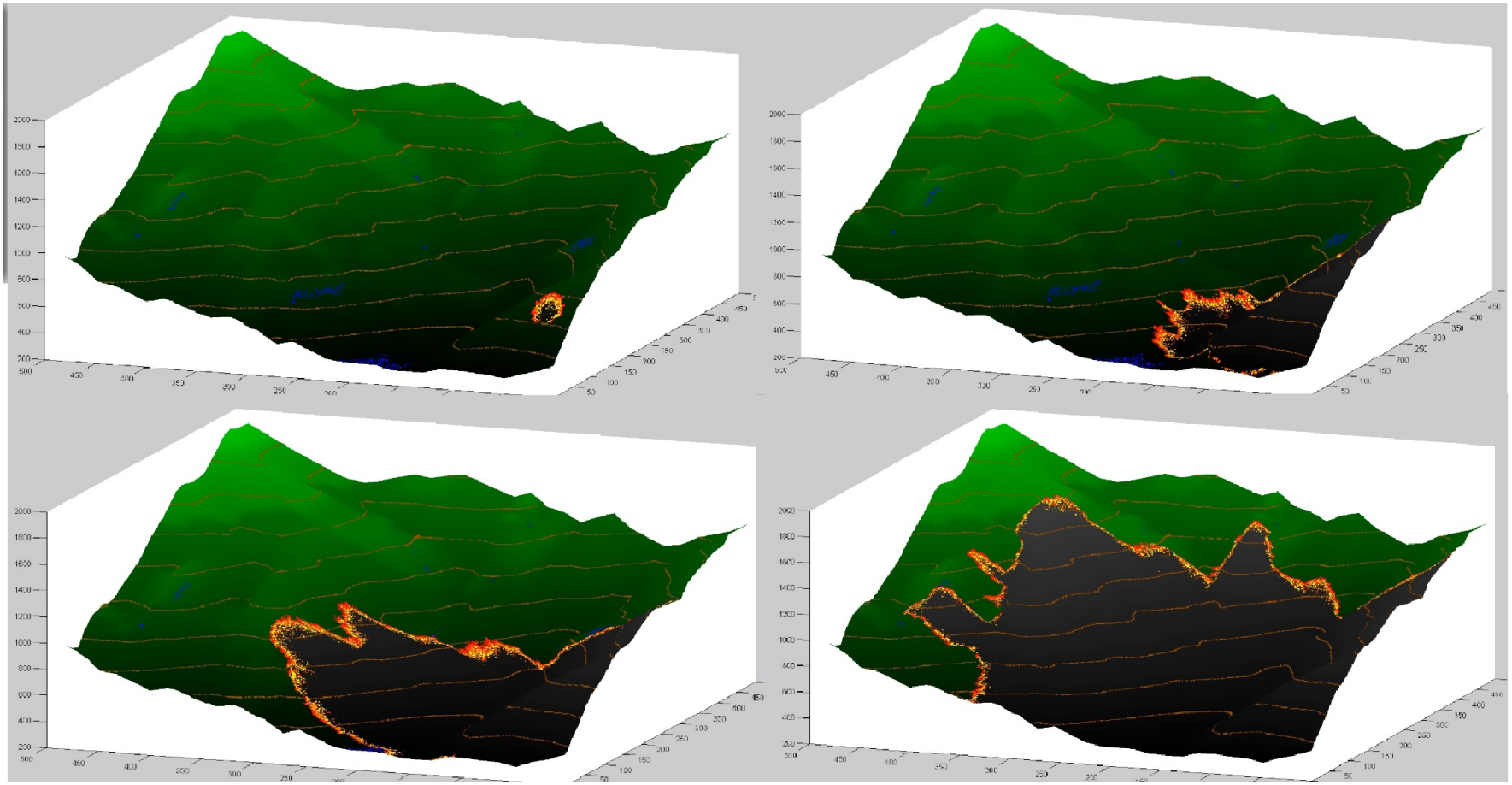
Program

propagation

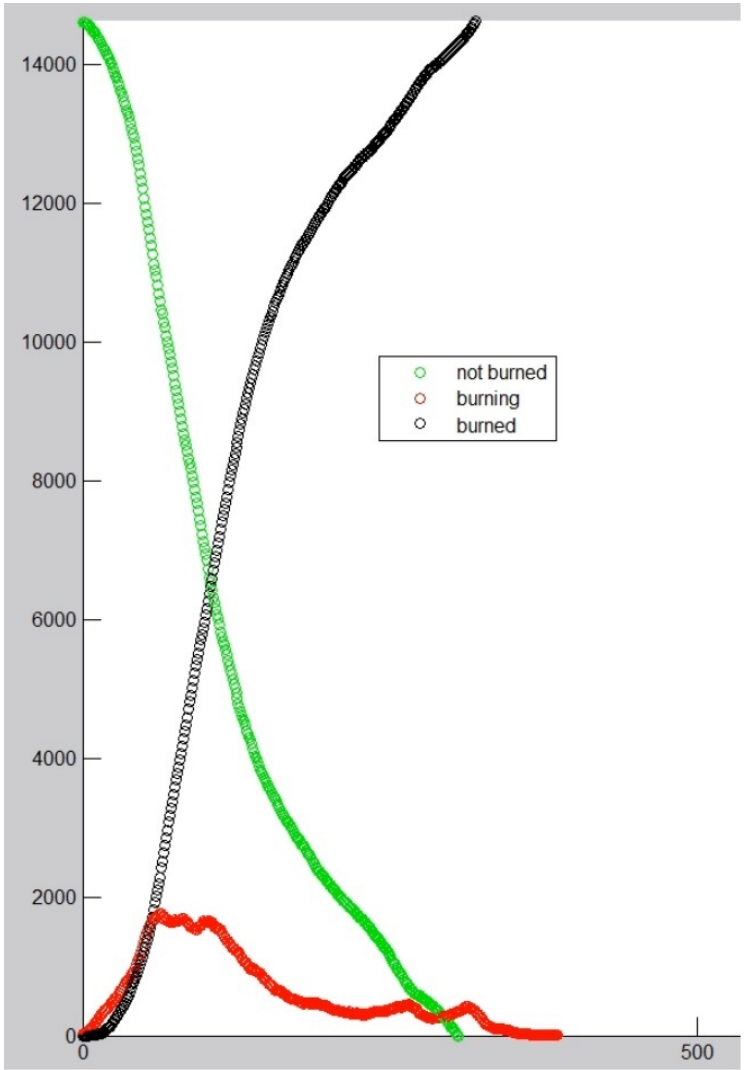


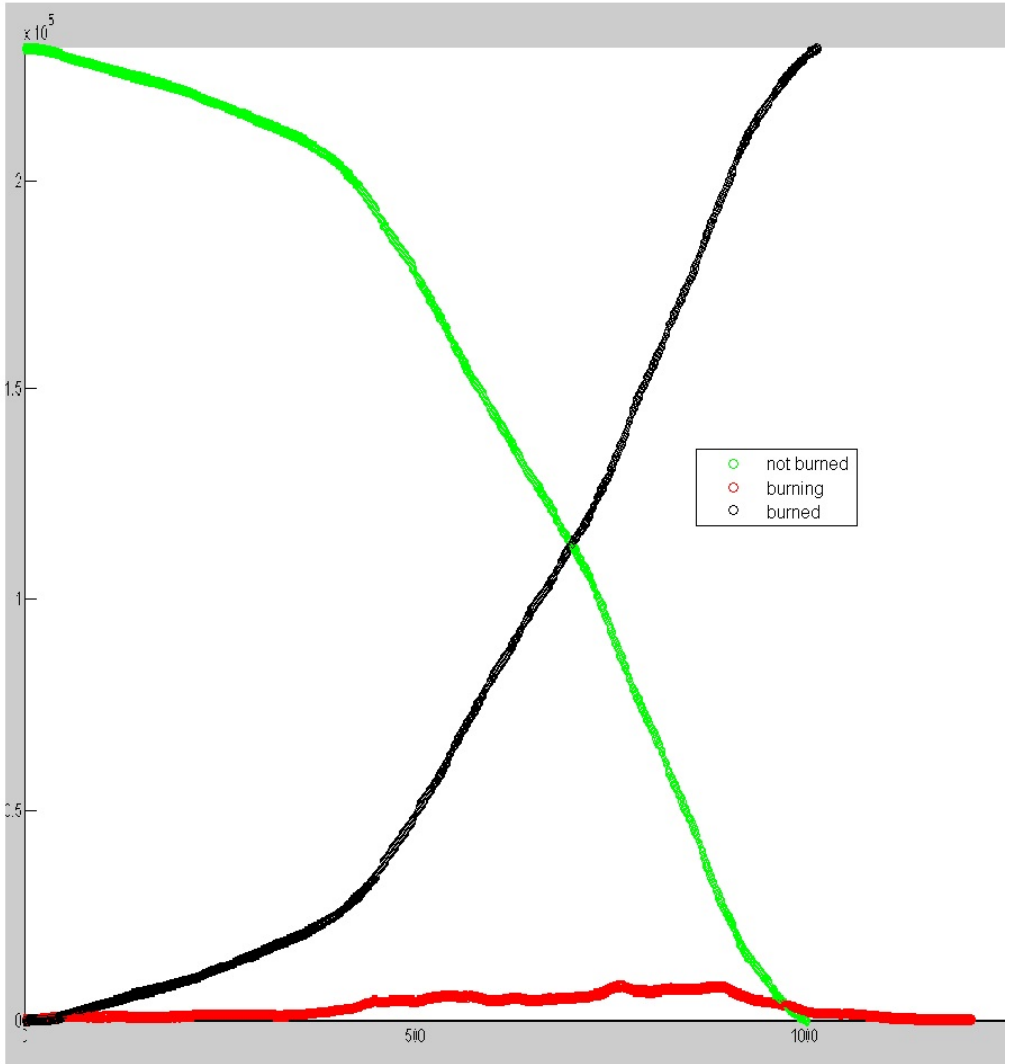
- 8 neighbours (α step of burning)
- new wind neighbour
- new slope neighbour
- calculate *propagation*, if *rand* $<$ *propagation*, cell burns
- cells still burning: 1$\rightarrow$6

Results

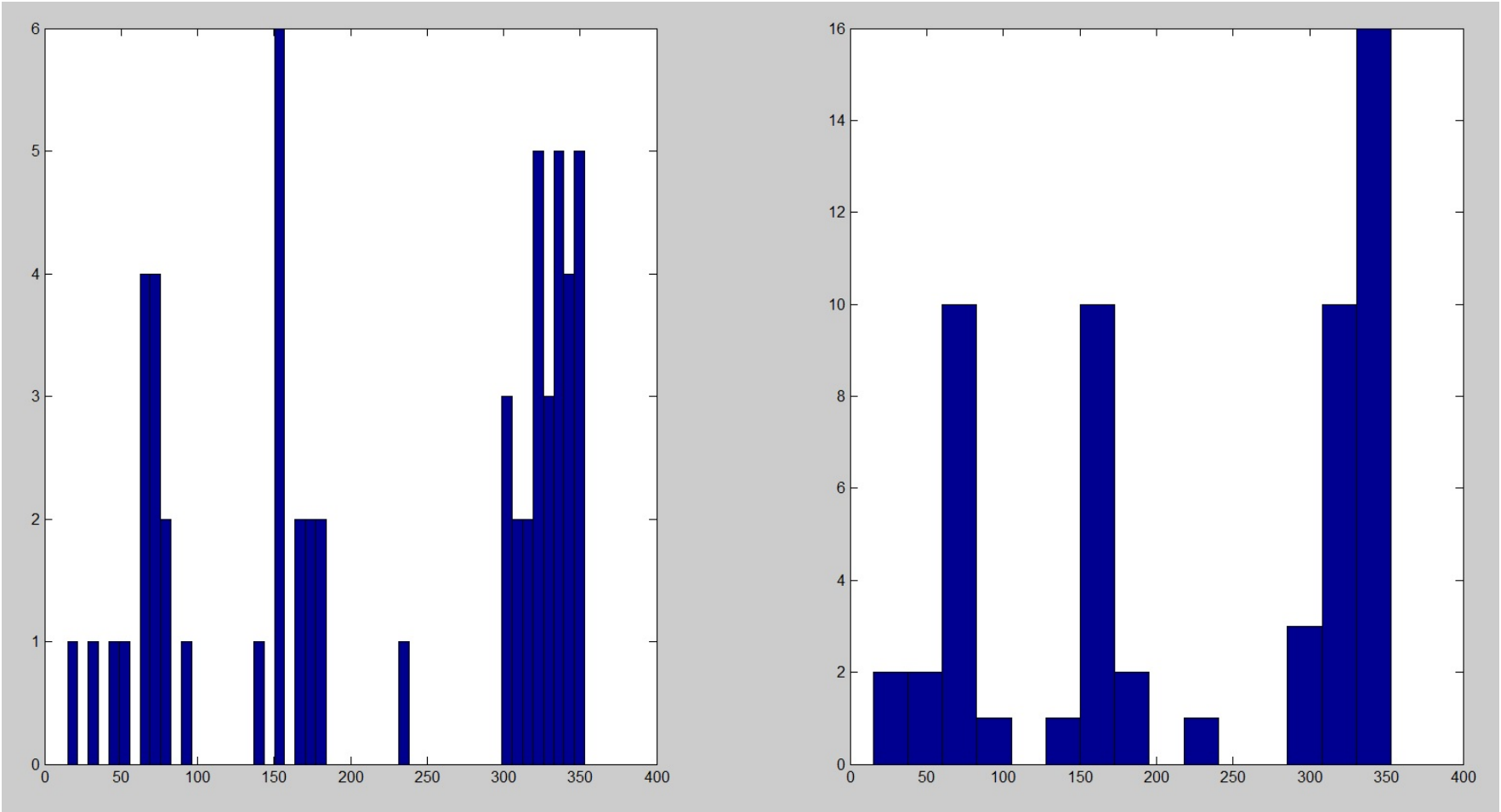


Results


14000
12000
10000
8000
6000
4000
2000
0
0
500
not burned
burning
burned


x 10^5
2
1.5
1
0.5
0
5000
10000
not burned
burning
burned

Results


0
1
2
3
4
5
6
0
50
100
150
200
250
300
350
400
0
2
4
6
8
10
12
14
16
0
50
100
150
200
250
300
350
400

Results

Simulation video

Application and conclusion

- Relationship with wind and ground conformation
- Houses burned
- Prevent, where start fireman working
- Real forest and real data with input variables, which can be changed from a user