ESCAPE THE BULLET

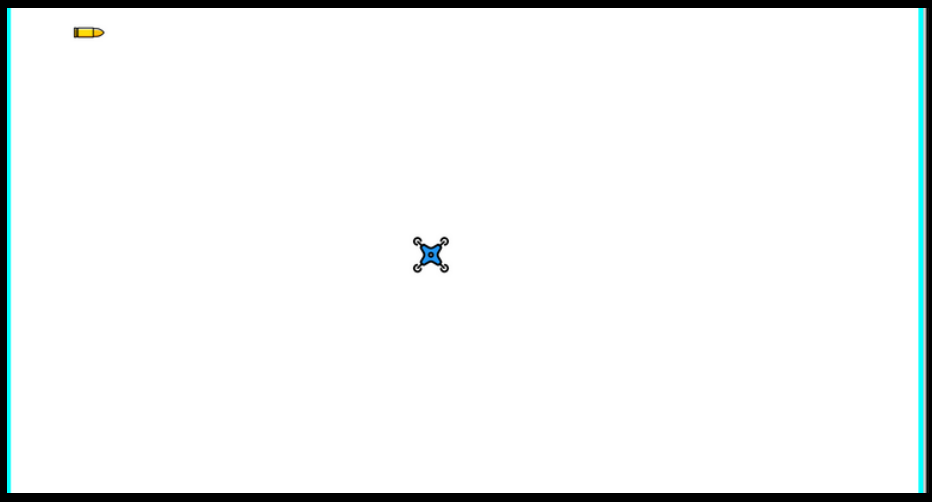
A GAME AUTOMATION USING RL

GLANCE

- level-1.0 (single bullet , specific direction)
- level-1.1(single bullet , random direction)
- level-1.2(3 bullets)
- level-2 (3bullets + shoot)

contribution

- game and train vamsi , env-vanshika for level-1.0,1.2
- game and train vanshika , env-vanshika for level-1.1
- level-2 vamsi (A2C), level-2(PPO)- vanshika



git hub link

https://github.com/sunkustar/ESCAPE-THE-BULLET

BY

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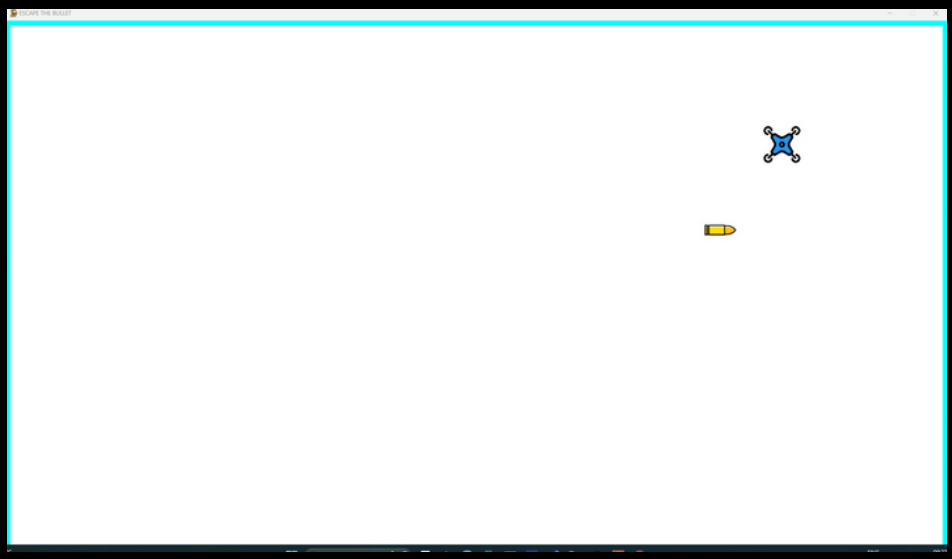
level-1

the bullet keeps reflecting in 45 degrees angle
the drone has to escape from the bullet



env

game dynamics

bullet speed 30
bullet angle 45
drone speed 10
field size(1920x1080)

ENV
observation space -> Multidiscrete 4d (drone x,y , bullet x,y)
action space -> Multidiscret(4)(up,down, right ,left)

rewards

- passive rewards for staying alive
- reward averaged from distance between drone and bullet
- huge negative reward on crossing boundaries
- big negative apon death

termination -> upon death

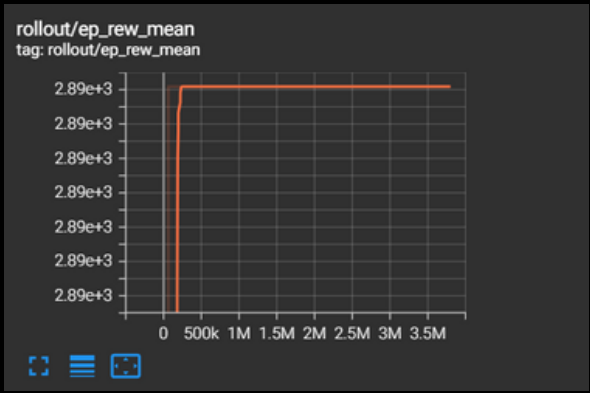
detailed code in models/level-1 folder

Training

we have created environment in gymanasium and used stablebaseline3 for training .

we tried A2C and PPO algorithms as they are suitable for multidiscrete and box space types

logs are in logs folder



Observation

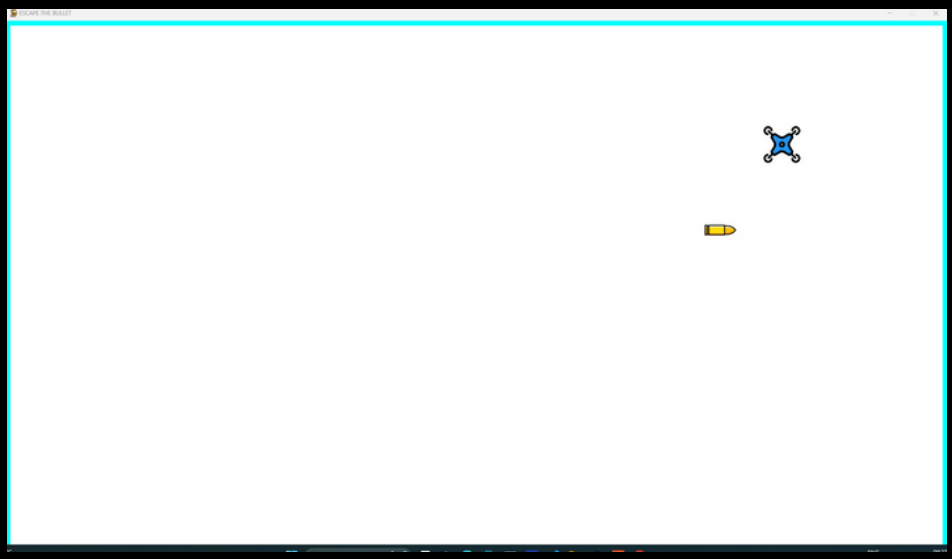
the drone found lattice points in the field which cant be reached by bullet for long time

Note

env in env.py
algorithm code in model.py
test run in test.py
load model and run load.py
tensorboard logs in logs
one demo video
in respective folders in model folder in github

level-1 (direction)

the bullet keeps reflecting in random angle
the drone has to escape from the bullet



env

game dynamics

bullet speed 30
bullet angle random
drone speed 10
field size(1920x1080)

ENV
observation space -> Multidiscrete 4d (drone x,y , bullet x,y)
action space -> Multidiscret(4)(up,down, right ,left)

rewards

- passive rewards for staying alive
- reward averaged from distance between drone and bullet
- huge negative reward on crossing boundaries
- big negative apon death

termination -> upon death

detailed code in models/level-1 folder

Training

we have created environment in gymanasium and used stablebaseline3 for training .

we tried A2C and PPO algorithms as they are suitable for multidiscrete and box space types

logs are in logs folder

Observation

the drone wasnt able to survive very long like before but it indeed leanrt good lattice points for many angles.

Note

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algorithm code in model.py
test run in test.py
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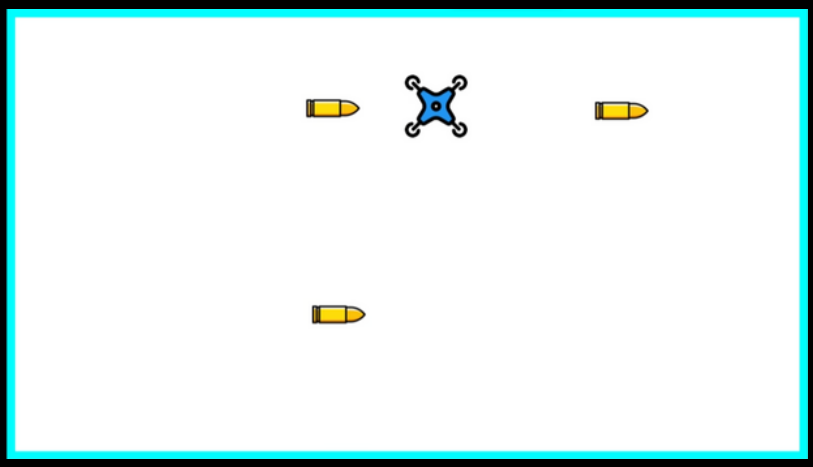
level-1 (3 bullets)

the bullet keeps reflecting in 45 degrees angle
the drone has to escape from the bullet



env

game dynamics

bullet speed 30 and 3 bullets at once
bullet angle 45,135,45
drone speed 10
field size(800*600) to reduce state space

ENV
observation space -> Multidiscrete 10d (drone x,y , bullet x,y)
action space -> Multidiscret(36,36)(movement,shoot angle)

rewards

- positive reward for killing the bullet
- high positive for killing all bullets
- negative reward for dying
- huge negative reward for out of boundary
-

termination -> upon death , upon killing all 3 bullets

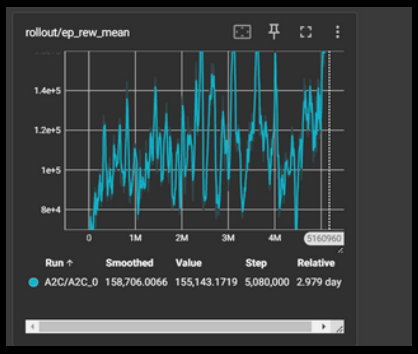
detailed code in models/level-2 folder

Training

we have created environment in gymanasium and used stablebaseline3 for training .

we tried A2C and PPO algorithms as they are suitable for multidiscrete and box space types

logs are in logs folder



Observation

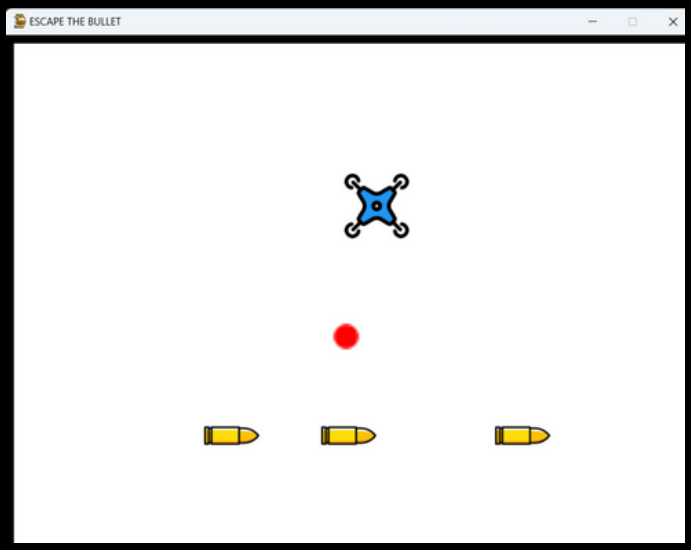
the drone is perfoming optimally good escaping within the gaps

Note

env in env.py
algorithm code in model.py
test run in test.py
load model and run load.py
tensorboard logs in logs
one demo video
in respective folders in model folder in github

level-2 (3 bullets, shoot)

the bullets keeps reflecting in 45 degrees angle
the drone has to escape from the bullet if they hit by red bullet they passout



env

game dynamics

bullet speed 30 and 3 bullets at once
bullet angle 45,135,45
drone speed 10
field size(960x540) to reduce state space

ENV
observation space -> Multidiscrete 8d (drone x,y , bullet x,y)
action space -> Multidiscret(4)(up,down, right ,left)

rewards

- passive rewards for staying alive
- reward averaged from distance between drone and 3 bullet
- huge negative reward on crossing boundaries
- big negative reward on getting closer to any of the bullet
- big negative apon death

termination -> upon death

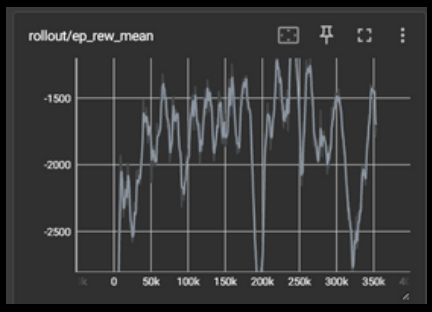
detailed code in models/level-1 folder

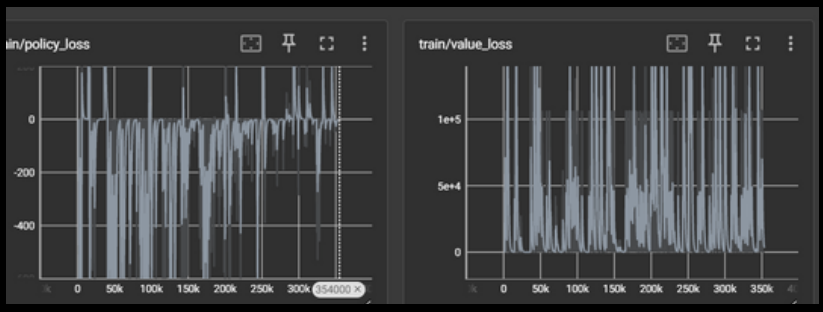
Training

we have created environment in gymanasium and used stablebaseline3 for training .

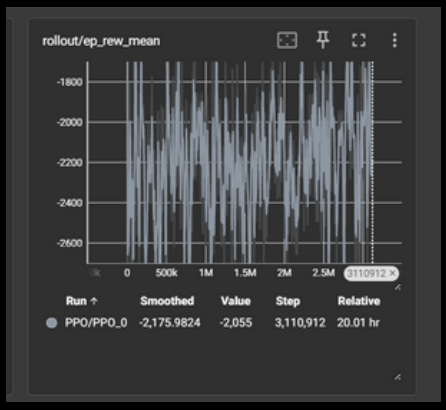
we tried A2C and PPO algorithms as they are suitable for multidiscrete and box space types

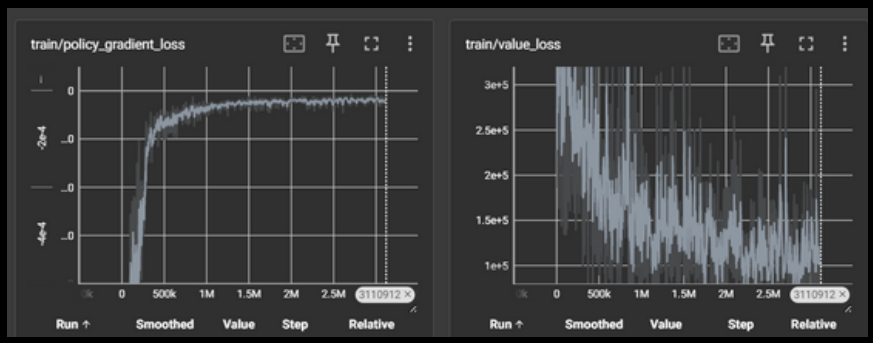
logs are in logs folder





A2C





PPO

Observation

though the training goes well , it needs more time to train better

SCOPE FOR IMPROVEMENT :

1) More triaining time
2) More focus on hyperparameter tuning
3) change in shape of boundaries