

```

41 ax2.plot(epochs,p(epochs),"r--")
42
43
44 ax2.set_title("Pasos por juego")
45 ax2.set_xlabel("epochs")
46
47 ax2.grid()
48
49 plt.show()
50
51 grafica_entrenamiento2(train_history)
52 #calcula_media_test(dqn)

```

```

❏ -----
NameError                                Traceback (most recent call last)
<ipython-input-2-24aadb4a05dd> in <module>()
    41     plt.show()
    42
--> 43 grafica_entrenamiento2(train_history)
    44 #calcula_media_test(dqn)

NameError: name 'train_history' is not defined

```

SEARCH STACK OVERFLOW

```

1 #####
2 # Continuar entrenamiento desde un archivo de pesos guardados
3 #
4
5 # buscamos si hay archivos de pesos guardados y si hay procesamos el último
6 pesos_guardados = glob.glob('*.h5f')
7 if len(pesos_guardados):
8
9     # Tomamos el último archivo
10    pesos_mas_recientes = max(pesos_guardados)
11    print('Cargando los pesos:',pesos_mas_recientes)
12
13    # Nombre de archivo a guardar nuevos pesos
14    now = datetime.now()
15    date_time = now.strftime("%Y%m%d%H%M")
16    weights_filename = 'dqn_{}_weights.h5f'.format(ENV_NAME)
17    weights_filename = date_time + '_' + weights_filename
18
19    # Hacemo un checkpoint que guarde los pesos con mejor reward
20    saved_weights = date_time + '_' + "weights-improvement-{epoch:02d}-{episode_reward:.2f}.hdf5"
21    checkpoint = ModelCheckpoint(saved_weights, monitor='episode_reward', save_best_only=True, save_weights_only=True, mode='max')
22
23    memory = SequentialMemory(limit=10000, window_length=WINDOW_LENGTH)
24
25    policy = LinearAnnealedPolicy(EpsGreedyQPolicy(), attr='eps', value_max=0.02,
26                                  value_min=0.02, value_test=0.05, nb_steps=100000)
27
28    #dqn = DQNAgent(model=model, nb_actions=nb_actions, policy=policy, memory=memory,
29    #               processor=processor, nb_steps_warmup=1000, gamma=.99,
30    #               target_model_update=1000,
31    #               train_interval=4, batch_size=32,
32    #               enable_double_dqn=True,
33    #               enable_dueling_network=True, dueling_type='avg'
34    #               )
35    dqn = DQNAgent(model=model, nb_actions=nb_actions, policy=policy, memory=memory,
36                  processor=processor, nb_steps_warmup=agent_nb_steps_warmup, gamma=.99, target_model_update=agent_target_model_update,
37                  train_interval=agent_train_interval, batch_size=agent_batch_size,
38                  enable_double_dqn=True,
39                  enable_dueling_network=True, dueling_type='avg'
40                  )
41
42    optimizer = optimizer_type # TO-DO
43    dqn.compile(optimizer, metrics=['mae'])
44
45    # cargar pesos de archivo para empezar el entrenamiento desde ese punto
46    dqn.load_weights(pesos_mas_recientes)
47    #dqn.load_weights('/content/201912151921_weights-improvement-73-13.00.hdf5')
48    nb_steps = 1500000
49    dqn.fit(env, nb_steps=nb_steps, verbose=2, visualize=False)
50
51    # guardar pesos finales de este entrenamiento
52    dqn.save_weights(weights_filename, overwrite=True)
53    print("Pesos guardados en:",weights_filename)
54
55    # probar nueva red
56    nb_episodes = 3
57    dqn.test(env, nb_episodes=nb_episodes, visualize=False)
58

```

❏

Cargando los pesos: 202001111554_dqn_PongDeterministic-v0_weights.h5f
Training for 1500000 steps ...

2524/1500000: episode: 1, duration: 6.922s, episode steps: 2524, steps per second: 365, episode reward: 14.000, mean rev
4733/1500000: episode: 2, duration: 5.569s, episode steps: 2209, steps per second: 397, episode reward: 16.000, mean rev
6728/1500000: episode: 3, duration: 5.053s, episode steps: 1995, steps per second: 395, episode reward: 17.000, mean rev
8660/1500000: episode: 4, duration: 4.941s, episode steps: 1932, steps per second: 391, episode reward: 15.000, mean rev
10940/1500000: episode: 5, duration: 11.395s, episode steps: 2280, steps per second: 200, episode reward: 15.000, mean rev
13454/1500000: episode: 6, duration: 15.590s, episode steps: 2514, steps per second: 161, episode reward: 11.000, mean rev
15677/1500000: episode: 7, duration: 13.901s, episode steps: 2223, steps per second: 160, episode reward: 12.000, mean rev
18078/1500000: episode: 8, duration: 15.393s, episode steps: 2401, steps per second: 156, episode reward: 13.000, mean rev
20051/1500000: episode: 9, duration: 12.525s, episode steps: 1973, steps per second: 158, episode reward: 16.000, mean rev
23074/1500000: episode: 10, duration: 19.140s, episode steps: 3023, steps per second: 158, episode reward: -3.000, mean rev
25712/1500000: episode: 11, duration: 16.690s, episode steps: 2638, steps per second: 158, episode reward: 12.000, mean rev
27527/1500000: episode: 12, duration: 11.443s, episode steps: 1815, steps per second: 159, episode reward: 19.000, mean rev
31126/1500000: episode: 13, duration: 22.844s, episode steps: 3599, steps per second: 158, episode reward: 4.000, mean rev
33173/1500000: episode: 14, duration: 12.968s, episode steps: 2047, steps per second: 158, episode reward: 17.000, mean rev
36071/1500000: episode: 15, duration: 18.416s, episode steps: 2898, steps per second: 157, episode reward: 11.000, mean rev
38647/1500000: episode: 16, duration: 16.257s, episode steps: 2576, steps per second: 158, episode reward: 12.000, mean rev
41148/1500000: episode: 17, duration: 15.652s, episode steps: 2501, steps per second: 160, episode reward: 13.000, mean rev
43303/1500000: episode: 18, duration: 13.254s, episode steps: 2155, steps per second: 163, episode reward: 17.000, mean rev
45694/1500000: episode: 19, duration: 14.809s, episode steps: 2391, steps per second: 161, episode reward: 16.000, mean rev
47623/1500000: episode: 20, duration: 11.873s, episode steps: 1929, steps per second: 162, episode reward: 18.000, mean rev
50629/1500000: episode: 21, duration: 18.730s, episode steps: 3006, steps per second: 160, episode reward: 6.000, mean rev
52988/1500000: episode: 22, duration: 14.396s, episode steps: 2359, steps per second: 164, episode reward: 14.000, mean rev
55914/1500000: episode: 23, duration: 17.900s, episode steps: 2926, steps per second: 163, episode reward: 9.000, mean rev
57867/1500000: episode: 24, duration: 11.917s, episode steps: 1953, steps per second: 164, episode reward: 19.000, mean rev
60510/1500000: episode: 25, duration: 16.276s, episode steps: 2643, steps per second: 162, episode reward: -1.000, mean rev
63170/1500000: episode: 26, duration: 16.152s, episode steps: 2660, steps per second: 165, episode reward: 14.000, mean rev
65269/1500000: episode: 27, duration: 12.708s, episode steps: 2099, steps per second: 165, episode reward: 17.000, mean rev
67551/1500000: episode: 28, duration: 14.371s, episode steps: 2282, steps per second: 159, episode reward: 16.000, mean rev
69962/1500000: episode: 29, duration: 14.889s, episode steps: 2411, steps per second: 162, episode reward: 14.000, mean rev
72745/1500000: episode: 30, duration: 17.005s, episode steps: 2783, steps per second: 164, episode reward: 10.000, mean rev
74700/1500000: episode: 31, duration: 12.116s, episode steps: 1955, steps per second: 161, episode reward: 18.000, mean rev
76728/1500000: episode: 32, duration: 12.397s, episode steps: 2028, steps per second: 164, episode reward: 17.000, mean rev
79282/1500000: episode: 33, duration: 15.646s, episode steps: 2554, steps per second: 163, episode reward: 10.000, mean rev
81538/1500000: episode: 34, duration: 13.824s, episode steps: 2256, steps per second: 163, episode reward: 13.000, mean rev
83686/1500000: episode: 35, duration: 13.050s, episode steps: 2148, steps per second: 165, episode reward: 16.000, mean rev
85925/1500000: episode: 36, duration: 13.693s, episode steps: 2239, steps per second: 164, episode reward: 17.000, mean rev
88501/1500000: episode: 37, duration: 16.213s, episode steps: 2576, steps per second: 159, episode reward: 9.000, mean rev
91322/1500000: episode: 38, duration: 17.491s, episode steps: 2821, steps per second: 161, episode reward: 7.000, mean rev
93711/1500000: episode: 39, duration: 14.769s, episode steps: 2389, steps per second: 162, episode reward: 11.000, mean rev
96365/1500000: episode: 40, duration: 16.393s, episode steps: 2654, steps per second: 162, episode reward: 11.000, mean rev
99291/1500000: episode: 41, duration: 18.010s, episode steps: 2926, steps per second: 162, episode reward: 12.000, mean rev
102284/1500000: episode: 42, duration: 18.253s, episode steps: 2993, steps per second: 164, episode reward: 8.000, mean rev
105207/1500000: episode: 43, duration: 17.693s, episode steps: 2923, steps per second: 165, episode reward: 8.000, mean rev
107758/1500000: episode: 44, duration: 15.583s, episode steps: 2551, steps per second: 164, episode reward: 13.000, mean rev
110276/1500000: episode: 45, duration: 15.422s, episode steps: 2518, steps per second: 163, episode reward: 10.000, mean rev
113200/1500000: episode: 46, duration: 18.044s, episode steps: 2924, steps per second: 162, episode reward: 9.000, mean rev
114883/1500000: episode: 47, duration: 10.446s, episode steps: 1683, steps per second: 161, episode reward: 21.000, mean rev
117547/1500000: episode: 48, duration: 16.780s, episode steps: 2664, steps per second: 159, episode reward: 11.000, mean rev
119662/1500000: episode: 49, duration: 13.066s, episode steps: 2115, steps per second: 162, episode reward: 16.000, mean rev
121405/1500000: episode: 50, duration: 10.857s, episode steps: 1743, steps per second: 161, episode reward: 21.000, mean rev
123624/1500000: episode: 51, duration: 13.812s, episode steps: 2219, steps per second: 161, episode reward: 16.000, mean rev
125990/1500000: episode: 52, duration: 14.681s, episode steps: 2366, steps per second: 161, episode reward: 12.000, mean rev
127974/1500000: episode: 53, duration: 12.346s, episode steps: 1984, steps per second: 161, episode reward: 17.000, mean rev
131441/1500000: episode: 54, duration: 21.483s, episode steps: 3467, steps per second: 161, episode reward: 5.000, mean rev
134299/1500000: episode: 55, duration: 17.690s, episode steps: 2858, steps per second: 162, episode reward: 9.000, mean rev
136228/1500000: episode: 56, duration: 11.953s, episode steps: 1929, steps per second: 161, episode reward: 19.000, mean rev
139571/1500000: episode: 57, duration: 20.694s, episode steps: 3343, steps per second: 162, episode reward: 2.000, mean rev
141788/1500000: episode: 58, duration: 13.602s, episode steps: 2217, steps per second: 163, episode reward: 16.000, mean rev
144035/1500000: episode: 59, duration: 13.494s, episode steps: 2247, steps per second: 167, episode reward: 15.000, mean rev
146488/1500000: episode: 60, duration: 14.764s, episode steps: 2453, steps per second: 166, episode reward: 16.000, mean rev
149491/1500000: episode: 61, duration: 18.577s, episode steps: 3003, steps per second: 162, episode reward: 4.000, mean rev
152049/1500000: episode: 62, duration: 15.790s, episode steps: 2558, steps per second: 162, episode reward: 12.000, mean rev
154067/1500000: episode: 63, duration: 12.380s, episode steps: 2018, steps per second: 163, episode reward: 17.000, mean rev
156419/1500000: episode: 64, duration: 14.390s, episode steps: 2352, steps per second: 163, episode reward: 13.000, mean rev
158784/1500000: episode: 65, duration: 14.445s, episode steps: 2365, steps per second: 164, episode reward: 14.000, mean rev
161123/1500000: episode: 66, duration: 14.351s, episode steps: 2339, steps per second: 163, episode reward: 16.000, mean rev
163153/1500000: episode: 67, duration: 12.497s, episode steps: 2030, steps per second: 162, episode reward: 19.000, mean rev
165181/1500000: episode: 68, duration: 12.448s, episode steps: 2028, steps per second: 163, episode reward: 17.000, mean rev
167639/1500000: episode: 69, duration: 15.538s, episode steps: 2458, steps per second: 158, episode reward: 11.000, mean rev
169658/1500000: episode: 70, duration: 12.323s, episode steps: 2019, steps per second: 164, episode reward: 14.000, mean rev
172663/1500000: episode: 71, duration: 18.439s, episode steps: 3005, steps per second: 163, episode reward: 7.000, mean rev
175040/1500000: episode: 72, duration: 14.522s, episode steps: 2377, steps per second: 164, episode reward: 14.000, mean rev
177205/1500000: episode: 73, duration: 13.229s, episode steps: 2165, steps per second: 164, episode reward: 16.000, mean rev
179723/1500000: episode: 74, duration: 15.372s, episode steps: 2518, steps per second: 164, episode reward: 12.000, mean rev
182181/1500000: episode: 75, duration: 15.166s, episode steps: 2458, steps per second: 162, episode reward: 13.000, mean rev
185196/1500000: episode: 76, duration: 18.110s, episode steps: 3015, steps per second: 166, episode reward: 1.000, mean rev
186987/1500000: episode: 77, duration: 10.979s, episode steps: 1791, steps per second: 163, episode reward: 18.000, mean rev
189255/1500000: episode: 78, duration: 13.863s, episode steps: 2268, steps per second: 164, episode reward: 16.000, mean rev
191834/1500000: episode: 79, duration: 15.827s, episode steps: 2579, steps per second: 163, episode reward: 11.000, mean rev
194368/1500000: episode: 80, duration: 15.282s, episode steps: 2534, steps per second: 166, episode reward: 12.000, mean rev
196413/1500000: episode: 81, duration: 12.364s, episode steps: 2045, steps per second: 165, episode reward: 16.000, mean rev
199410/1500000: episode: 82, duration: 18.243s, episode steps: 2997, steps per second: 164, episode reward: 2.000, mean rev
201590/1500000: episode: 83, duration: 13.306s, episode steps: 2180, steps per second: 164, episode reward: 12.000, mean rev
203951/1500000: episode: 84, duration: 14.361s, episode steps: 2361, steps per second: 164, episode reward: 12.000, mean rev
206286/1500000: episode: 85, duration: 14.215s, episode steps: 2335, steps per second: 164, episode reward: 13.000, mean rev
209056/1500000: episode: 86, duration: 16.788s, episode steps: 2770, steps per second: 165, episode reward: 13.000, mean rev
211200/1500000: episode: 87, duration: 13.041s, episode steps: 2144, steps per second: 164, episode reward: 14.000, mean rev
213109/1500000: episode: 88, duration: 11.607s, episode steps: 1909, steps per second: 164, episode reward: 15.000, mean rev
215906/1500000: episode: 89, duration: 16.942s, episode steps: 2797, steps per second: 165, episode reward: 11.000, mean rev
217994/1500000: episode: 90, duration: 12.960s, episode steps: 2088, steps per second: 161, episode reward: 15.000, mean rev
221099/1500000: episode: 91, duration: 18.861s, episode steps: 3105, steps per second: 165, episode reward: 9.000, mean rev
223031/1500000: episode: 92, duration: 11.812s, episode steps: 1932, steps per second: 164, episode reward: 18.000, mean rev

225140/1500000: episode: 93, duration: 12.740s, episode steps: 2109, steps per second: 166, episode reward: 13.000, mean 1
227052/1500000: episode: 94, duration: 11.590s, episode steps: 1912, steps per second: 165, episode reward: 19.000, mean 1
229372/1500000: episode: 95, duration: 13.824s, episode steps: 2320, steps per second: 168, episode reward: 14.000, mean 1
232148/1500000: episode: 96, duration: 16.878s, episode steps: 2776, steps per second: 164, episode reward: 8.000, mean 1
234515/1500000: episode: 97, duration: 14.384s, episode steps: 2367, steps per second: 165, episode reward: 10.000, mean 1
236485/1500000: episode: 98, duration: 11.919s, episode steps: 1970, steps per second: 165, episode reward: 16.000, mean 1
238578/1500000: episode: 99, duration: 12.655s, episode steps: 2093, steps per second: 165, episode reward: 17.000, mean 1
240583/1500000: episode: 100, duration: 12.191s, episode steps: 2005, steps per second: 164, episode reward: 15.000, mean
242614/1500000: episode: 101, duration: 12.399s, episode steps: 2031, steps per second: 164, episode reward: 18.000, mean
244851/1500000: episode: 102, duration: 13.662s, episode steps: 2237, steps per second: 164, episode reward: 15.000, mean
247098/1500000: episode: 103, duration: 13.760s, episode steps: 2247, steps per second: 163, episode reward: 14.000, mean
249269/1500000: episode: 104, duration: 13.285s, episode steps: 2171, steps per second: 163, episode reward: 15.000, mean
251107/1500000: episode: 105, duration: 11.169s, episode steps: 1838, steps per second: 165, episode reward: 18.000, mean
253481/1500000: episode: 106, duration: 14.460s, episode steps: 2374, steps per second: 164, episode reward: 14.000, mean
255614/1500000: episode: 107, duration: 12.998s, episode steps: 2133, steps per second: 164, episode reward: 16.000, mean
257826/1500000: episode: 108, duration: 13.456s, episode steps: 2212, steps per second: 164, episode reward: 17.000, mean
260395/1500000: episode: 109, duration: 15.592s, episode steps: 2569, steps per second: 165, episode reward: 15.000, mean
262999/1500000: episode: 110, duration: 15.811s, episode steps: 2604, steps per second: 165, episode reward: 11.000, mean
265437/1500000: episode: 111, duration: 14.934s, episode steps: 2438, steps per second: 163, episode reward: 18.000, mean
267910/1500000: episode: 112, duration: 15.110s, episode steps: 2473, steps per second: 164, episode reward: 13.000, mean
270550/1500000: episode: 113, duration: 16.115s, episode steps: 2640, steps per second: 164, episode reward: 12.000, mean
273904/1500000: episode: 114, duration: 20.332s, episode steps: 3354, steps per second: 165, episode reward: 11.000, mean
276134/1500000: episode: 115, duration: 13.607s, episode steps: 2230, steps per second: 164, episode reward: 15.000, mean
279118/1500000: episode: 116, duration: 18.058s, episode steps: 2984, steps per second: 165, episode reward: 9.000, mean 1
281049/1500000: episode: 117, duration: 11.775s, episode steps: 1931, steps per second: 164, episode reward: 19.000, mean
284464/1500000: episode: 118, duration: 20.965s, episode steps: 3415, steps per second: 163, episode reward: 7.000, mean 1
286383/1500000: episode: 119, duration: 11.827s, episode steps: 1919, steps per second: 162, episode reward: 18.000, mean
288938/1500000: episode: 120, duration: 15.837s, episode steps: 2555, steps per second: 161, episode reward: 17.000, mean
291320/1500000: episode: 121, duration: 14.549s, episode steps: 2382, steps per second: 164, episode reward: 16.000, mean
294066/1500000: episode: 122, duration: 16.757s, episode steps: 2746, steps per second: 164, episode reward: 10.000, mean
296592/1500000: episode: 123, duration: 15.528s, episode steps: 2526, steps per second: 163, episode reward: 15.000, mean
298381/1500000: episode: 124, duration: 11.005s, episode steps: 1789, steps per second: 163, episode reward: 19.000, mean
300488/1500000: episode: 125, duration: 13.037s, episode steps: 2107, steps per second: 162, episode reward: 15.000, mean
303009/1500000: episode: 126, duration: 15.639s, episode steps: 2521, steps per second: 161, episode reward: 15.000, mean
305852/1500000: episode: 127, duration: 17.700s, episode steps: 2843, steps per second: 161, episode reward: 10.000, mean
308292/1500000: episode: 128, duration: 14.940s, episode steps: 2440, steps per second: 163, episode reward: -5.000, mean
310558/1500000: episode: 129, duration: 13.946s, episode steps: 2266, steps per second: 162, episode reward: 16.000, mean
312463/1500000: episode: 130, duration: 11.851s, episode steps: 1905, steps per second: 161, episode reward: 17.000, mean
314969/1500000: episode: 131, duration: 15.569s, episode steps: 2506, steps per second: 161, episode reward: 14.000, mean
317019/1500000: episode: 132, duration: 12.668s, episode steps: 2050, steps per second: 162, episode reward: 17.000, mean
319098/1500000: episode: 133, duration: 13.187s, episode steps: 2079, steps per second: 158, episode reward: 17.000, mean
321583/1500000: episode: 134, duration: 15.495s, episode steps: 2485, steps per second: 160, episode reward: 12.000, mean
324225/1500000: episode: 135, duration: 16.459s, episode steps: 2642, steps per second: 161, episode reward: 13.000, mean
326636/1500000: episode: 136, duration: 15.039s, episode steps: 2411, steps per second: 160, episode reward: 14.000, mean
328773/1500000: episode: 137, duration: 13.279s, episode steps: 2137, steps per second: 161, episode reward: 14.000, mean
331211/1500000: episode: 138, duration: 15.095s, episode steps: 2438, steps per second: 162, episode reward: 15.000, mean
333597/1500000: episode: 139, duration: 14.553s, episode steps: 2386, steps per second: 164, episode reward: 12.000, mean
336089/1500000: episode: 140, duration: 15.318s, episode steps: 2492, steps per second: 163, episode reward: 14.000, mean
338110/1500000: episode: 141, duration: 12.244s, episode steps: 2021, steps per second: 165, episode reward: 17.000, mean
340522/1500000: episode: 142, duration: 14.725s, episode steps: 2412, steps per second: 164, episode reward: 12.000, mean
342762/1500000: episode: 143, duration: 13.696s, episode steps: 2240, steps per second: 164, episode reward: 15.000, mean
344501/1500000: episode: 144, duration: 10.619s, episode steps: 1739, steps per second: 164, episode reward: 19.000, mean
347145/1500000: episode: 145, duration: 16.273s, episode steps: 2644, steps per second: 162, episode reward: 12.000, mean
349047/1500000: episode: 146, duration: 11.496s, episode steps: 1902, steps per second: 165, episode reward: 18.000, mean
351578/1500000: episode: 147, duration: 15.421s, episode steps: 2531, steps per second: 164, episode reward: 15.000, mean
353549/1500000: episode: 148, duration: 11.984s, episode steps: 1971, steps per second: 164, episode reward: 19.000, mean
355316/1500000: episode: 149, duration: 10.775s, episode steps: 1767, steps per second: 164, episode reward: 19.000, mean
357451/1500000: episode: 150, duration: 12.951s, episode steps: 2135, steps per second: 165, episode reward: 17.000, mean
359911/1500000: episode: 151, duration: 15.038s, episode steps: 2460, steps per second: 164, episode reward: 12.000, mean
361728/1500000: episode: 152, duration: 11.168s, episode steps: 1817, steps per second: 163, episode reward: 19.000, mean
364115/1500000: episode: 153, duration: 14.525s, episode steps: 2387, steps per second: 164, episode reward: 15.000, mean
366495/1500000: episode: 154, duration: 14.495s, episode steps: 2380, steps per second: 164, episode reward: 14.000, mean
368547/1500000: episode: 155, duration: 12.534s, episode steps: 2052, steps per second: 164, episode reward: 19.000, mean
371391/1500000: episode: 156, duration: 17.605s, episode steps: 2844, steps per second: 162, episode reward: 8.000, mean 1
373872/1500000: episode: 157, duration: 15.179s, episode steps: 2481, steps per second: 163, episode reward: 15.000, mean
375891/1500000: episode: 158, duration: 12.393s, episode steps: 2019, steps per second: 163, episode reward: 17.000, mean
378827/1500000: episode: 159, duration: 17.879s, episode steps: 2936, steps per second: 164, episode reward: 12.000, mean
381258/1500000: episode: 160, duration: 14.858s, episode steps: 2431, steps per second: 164, episode reward: 16.000, mean
383587/1500000: episode: 161, duration: 14.171s, episode steps: 2329, steps per second: 164, episode reward: 15.000, mean
385794/1500000: episode: 162, duration: 13.321s, episode steps: 2207, steps per second: 166, episode reward: 17.000, mean
388757/1500000: episode: 163, duration: 17.789s, episode steps: 2963, steps per second: 167, episode reward: 12.000, mean
391453/1500000: episode: 164, duration: 16.396s, episode steps: 2696, steps per second: 164, episode reward: 14.000, mean
394011/1500000: episode: 165, duration: 15.613s, episode steps: 2558, steps per second: 164, episode reward: 13.000, mean
396085/1500000: episode: 166, duration: 12.675s, episode steps: 2074, steps per second: 164, episode reward: 18.000, mean
398685/1500000: episode: 167, duration: 15.879s, episode steps: 2600, steps per second: 164, episode reward: 10.000, mean
400626/1500000: episode: 168, duration: 11.923s, episode steps: 1941, steps per second: 163, episode reward: 19.000, mean
403317/1500000: episode: 169, duration: 16.449s, episode steps: 2691, steps per second: 164, episode reward: 13.000, mean
405438/1500000: episode: 170, duration: 12.902s, episode steps: 2121, steps per second: 164, episode reward: 18.000, mean
408031/1500000: episode: 171, duration: 15.884s, episode steps: 2593, steps per second: 163, episode reward: 14.000, mean
409695/1500000: episode: 172, duration: 10.170s, episode steps: 1664, steps per second: 164, episode reward: 21.000, mean
411529/1500000: episode: 173, duration: 11.229s, episode steps: 1834, steps per second: 163, episode reward: 19.000, mean
413247/1500000: episode: 174, duration: 10.528s, episode steps: 1718, steps per second: 163, episode reward: 20.000, mean
415059/1500000: episode: 175, duration: 11.071s, episode steps: 1812, steps per second: 164, episode reward: 19.000, mean
416891/1500000: episode: 176, duration: 11.104s, episode steps: 1832, steps per second: 165, episode reward: 20.000, mean
418896/1500000: episode: 177, duration: 12.245s, episode steps: 2005, steps per second: 164, episode reward: 17.000, mean
420720/1500000: episode: 178, duration: 11.455s, episode steps: 1824, steps per second: 159, episode reward: 20.000, mean
422400/1500000: episode: 179, duration: 10.265s, episode steps: 1680, steps per second: 164, episode reward: 20.000, mean
424724/1500000: episode: 180, duration: 13.976s, episode steps: 2324, steps per second: 166, episode reward: 18.000, mean
426383/1500000: episode: 181, duration: 9.905s, episode steps: 1659, steps per second: 167, episode reward: 21.000, mean 1
428684/1500000: episode: 182, duration: 13.947s, episode steps: 2301, steps per second: 165, episode reward: 16.000, mean
431449/1500000: episode: 183, duration: 16.830s, episode steps: 2765, steps per second: 164, episode reward: 10.000, mean
434141/1500000: episode: 184, duration: 16.466s, episode steps: 2692, steps per second: 163, episode reward: 12.000, mean
436356/1500000: episode: 185, duration: 13.480s, episode steps: 2215, steps per second: 164, episode reward: 16.000, mean
439205/1500000: episode: 186, duration: 17.404s, episode steps: 2849, steps per second: 164, episode reward: 8.000, mean 1
441600/1500000: episode: 187, duration: 14.775s, episode steps: 2395, steps per second: 162, episode reward: 13.000, mean

443645/1500000: episode: 188, duration: 12.545s, episode steps: 2045, steps per second: 163, episode reward: 16.000, mean
445476/1500000: episode: 189, duration: 11.171s, episode steps: 1831, steps per second: 164, episode reward: 19.000, mean
447384/1500000: episode: 190, duration: 11.753s, episode steps: 1908, steps per second: 162, episode reward: 18.000, mean
449350/1500000: episode: 191, duration: 12.080s, episode steps: 1966, steps per second: 163, episode reward: 18.000, mean
451745/1500000: episode: 192, duration: 14.605s, episode steps: 2395, steps per second: 164, episode reward: 15.000, mean
453718/1500000: episode: 193, duration: 12.132s, episode steps: 1973, steps per second: 163, episode reward: 19.000, mean
455598/1500000: episode: 194, duration: 11.524s, episode steps: 1880, steps per second: 163, episode reward: 18.000, mean
458193/1500000: episode: 195, duration: 15.882s, episode steps: 2595, steps per second: 163, episode reward: 13.000, mean
460486/1500000: episode: 196, duration: 14.128s, episode steps: 2293, steps per second: 162, episode reward: 15.000, mean
463231/1500000: episode: 197, duration: 16.777s, episode steps: 2745, steps per second: 164, episode reward: 9.000, mean
465139/1500000: episode: 198, duration: 11.528s, episode steps: 1908, steps per second: 166, episode reward: 18.000, mean
466922/1500000: episode: 199, duration: 10.838s, episode steps: 1783, steps per second: 165, episode reward: 19.000, mean
468803/1500000: episode: 200, duration: 11.638s, episode steps: 1881, steps per second: 162, episode reward: 19.000, mean
470999/1500000: episode: 201, duration: 13.846s, episode steps: 2196, steps per second: 159, episode reward: 17.000, mean
472936/1500000: episode: 202, duration: 11.866s, episode steps: 1937, steps per second: 163, episode reward: 16.000, mean
474740/1500000: episode: 203, duration: 11.146s, episode steps: 1804, steps per second: 162, episode reward: 20.000, mean
477161/1500000: episode: 204, duration: 14.856s, episode steps: 2421, steps per second: 163, episode reward: 13.000, mean
478957/1500000: episode: 205, duration: 10.989s, episode steps: 1796, steps per second: 163, episode reward: 19.000, mean
481570/1500000: episode: 206, duration: 16.095s, episode steps: 2613, steps per second: 162, episode reward: 12.000, mean
483843/1500000: episode: 207, duration: 14.000s, episode steps: 2273, steps per second: 162, episode reward: 12.000, mean
486567/1500000: episode: 208, duration: 16.699s, episode steps: 2724, steps per second: 163, episode reward: 12.000, mean
488421/1500000: episode: 209, duration: 11.318s, episode steps: 1854, steps per second: 164, episode reward: 18.000, mean
490994/1500000: episode: 210, duration: 15.837s, episode steps: 2573, steps per second: 162, episode reward: 8.000, mean
492797/1500000: episode: 211, duration: 11.122s, episode steps: 1803, steps per second: 162, episode reward: 20.000, mean
495061/1500000: episode: 212, duration: 14.008s, episode steps: 2264, steps per second: 162, episode reward: 14.000, mean
496906/1500000: episode: 213, duration: 11.343s, episode steps: 1845, steps per second: 163, episode reward: 18.000, mean
499106/1500000: episode: 214, duration: 13.435s, episode steps: 2200, steps per second: 164, episode reward: 18.000, mean
501229/1500000: episode: 215, duration: 13.019s, episode steps: 2123, steps per second: 163, episode reward: 15.000, mean
503714/1500000: episode: 216, duration: 15.035s, episode steps: 2485, steps per second: 165, episode reward: 12.000, mean
505856/1500000: episode: 217, duration: 13.034s, episode steps: 2142, steps per second: 164, episode reward: 16.000, mean
507951/1500000: episode: 218, duration: 12.786s, episode steps: 2095, steps per second: 164, episode reward: 16.000, mean
510379/1500000: episode: 219, duration: 14.896s, episode steps: 2428, steps per second: 163, episode reward: 14.000, mean
512496/1500000: episode: 220, duration: 12.862s, episode steps: 2117, steps per second: 165, episode reward: 16.000, mean
514664/1500000: episode: 221, duration: 13.318s, episode steps: 2168, steps per second: 163, episode reward: 18.000, mean
516679/1500000: episode: 222, duration: 12.296s, episode steps: 2015, steps per second: 164, episode reward: 16.000, mean
518811/1500000: episode: 223, duration: 13.070s, episode steps: 2132, steps per second: 163, episode reward: 15.000, mean
521014/1500000: episode: 224, duration: 13.832s, episode steps: 2203, steps per second: 159, episode reward: 15.000, mean
523444/1500000: episode: 225, duration: 15.022s, episode steps: 2430, steps per second: 162, episode reward: 15.000, mean
525481/1500000: episode: 226, duration: 12.499s, episode steps: 2037, steps per second: 163, episode reward: 16.000, mean
527419/1500000: episode: 227, duration: 11.829s, episode steps: 1938, steps per second: 164, episode reward: 18.000, mean
529515/1500000: episode: 228, duration: 12.755s, episode steps: 2096, steps per second: 164, episode reward: 16.000, mean
532068/1500000: episode: 229, duration: 15.614s, episode steps: 2553, steps per second: 164, episode reward: 14.000, mean
533993/1500000: episode: 230, duration: 11.625s, episode steps: 1925, steps per second: 166, episode reward: 17.000, mean
536533/1500000: episode: 231, duration: 15.505s, episode steps: 2540, steps per second: 164, episode reward: 12.000, mean
538820/1500000: episode: 232, duration: 13.877s, episode steps: 2287, steps per second: 165, episode reward: 15.000, mean
540956/1500000: episode: 233, duration: 13.102s, episode steps: 2136, steps per second: 163, episode reward: 15.000, mean
543410/1500000: episode: 234, duration: 15.047s, episode steps: 2454, steps per second: 163, episode reward: 10.000, mean
545661/1500000: episode: 235, duration: 13.908s, episode steps: 2251, steps per second: 162, episode reward: 15.000, mean
548181/1500000: episode: 236, duration: 15.325s, episode steps: 2520, steps per second: 164, episode reward: 12.000, mean
550113/1500000: episode: 237, duration: 11.789s, episode steps: 1932, steps per second: 164, episode reward: 18.000, mean
551885/1500000: episode: 238, duration: 10.843s, episode steps: 1772, steps per second: 163, episode reward: 19.000, mean
554384/1500000: episode: 239, duration: 15.275s, episode steps: 2499, steps per second: 164, episode reward: 10.000, mean
556337/1500000: episode: 240, duration: 11.859s, episode steps: 1953, steps per second: 165, episode reward: 18.000, mean
558628/1500000: episode: 241, duration: 14.026s, episode steps: 2291, steps per second: 163, episode reward: 16.000, mean
561268/1500000: episode: 242, duration: 16.227s, episode steps: 2640, steps per second: 163, episode reward: 12.000, mean
563232/1500000: episode: 243, duration: 12.035s, episode steps: 1964, steps per second: 163, episode reward: 18.000, mean
565587/1500000: episode: 244, duration: 20.413s, episode steps: 3355, steps per second: 164, episode reward: 8.000, mean
568741/1500000: episode: 245, duration: 13.151s, episode steps: 2154, steps per second: 164, episode reward: 16.000, mean
570553/1500000: episode: 246, duration: 11.168s, episode steps: 1812, steps per second: 162, episode reward: 19.000, mean
572699/1500000: episode: 247, duration: 13.496s, episode steps: 2146, steps per second: 159, episode reward: 15.000, mean
575103/1500000: episode: 248, duration: 14.583s, episode steps: 2404, steps per second: 165, episode reward: 16.000, mean
577537/1500000: episode: 249, duration: 14.838s, episode steps: 2434, steps per second: 164, episode reward: 16.000, mean
579533/1500000: episode: 250, duration: 12.183s, episode steps: 1996, steps per second: 164, episode reward: 18.000, mean
581538/1500000: episode: 251, duration: 12.275s, episode steps: 2005, steps per second: 163, episode reward: 17.000, mean
583681/1500000: episode: 252, duration: 13.167s, episode steps: 2143, steps per second: 163, episode reward: 17.000, mean
585756/1500000: episode: 253, duration: 12.561s, episode steps: 2075, steps per second: 165, episode reward: 17.000, mean
587535/1500000: episode: 254, duration: 10.871s, episode steps: 1779, steps per second: 164, episode reward: 20.000, mean
589401/1500000: episode: 255, duration: 11.386s, episode steps: 1866, steps per second: 164, episode reward: 18.000, mean
591354/1500000: episode: 256, duration: 11.848s, episode steps: 1953, steps per second: 165, episode reward: 15.000, mean
593520/1500000: episode: 257, duration: 13.138s, episode steps: 2166, steps per second: 165, episode reward: 17.000, mean
595416/1500000: episode: 258, duration: 11.945s, episode steps: 1896, steps per second: 159, episode reward: 19.000, mean
597488/1500000: episode: 259, duration: 12.883s, episode steps: 2072, steps per second: 161, episode reward: 16.000, mean
600819/1500000: episode: 260, duration: 20.874s, episode steps: 3331, steps per second: 160, episode reward: 4.000, mean
603211/1500000: episode: 261, duration: 15.195s, episode steps: 2392, steps per second: 157, episode reward: 16.000, mean
605187/1500000: episode: 262, duration: 12.362s, episode steps: 1976, steps per second: 160, episode reward: 18.000, mean
607248/1500000: episode: 263, duration: 12.849s, episode steps: 2061, steps per second: 160, episode reward: 18.000, mean
609520/1500000: episode: 264, duration: 14.117s, episode steps: 2272, steps per second: 161, episode reward: 17.000, mean
611961/1500000: episode: 265, duration: 15.091s, episode steps: 2441, steps per second: 162, episode reward: 15.000, mean
613944/1500000: episode: 266, duration: 12.268s, episode steps: 1983, steps per second: 162, episode reward: 18.000, mean
616103/1500000: episode: 267, duration: 13.447s, episode steps: 2159, steps per second: 161, episode reward: 19.000, mean
617905/1500000: episode: 268, duration: 11.133s, episode steps: 1802, steps per second: 162, episode reward: 18.000, mean
620321/1500000: episode: 269, duration: 15.033s, episode steps: 2416, steps per second: 161, episode reward: 15.000, mean
622332/1500000: episode: 270, duration: 12.979s, episode steps: 2011, steps per second: 155, episode reward: 19.000, mean
624412/1500000: episode: 271, duration: 12.842s, episode steps: 2080, steps per second: 162, episode reward: 16.000, mean
626223/1500000: episode: 272, duration: 11.141s, episode steps: 1811, steps per second: 163, episode reward: 19.000, mean
628042/1500000: episode: 273, duration: 11.162s, episode steps: 1819, steps per second: 163, episode reward: 20.000, mean
630551/1500000: episode: 274, duration: 15.359s, episode steps: 2509, steps per second: 163, episode reward: 16.000, mean
632742/1500000: episode: 275, duration: 13.361s, episode steps: 2191, steps per second: 164, episode reward: 15.000, mean
634644/1500000: episode: 276, duration: 11.808s, episode steps: 1902, steps per second: 161, episode reward: 18.000, mean
636508/1500000: episode: 277, duration: 11.490s, episode steps: 1864, steps per second: 162, episode reward: 19.000, mean
638798/1500000: episode: 278, duration: 14.034s, episode steps: 2290, steps per second: 163, episode reward: 12.000, mean
641426/1500000: episode: 279, duration: 16.145s, episode steps: 2628, steps per second: 163, episode reward: 13.000, mean
643366/1500000: episode: 280, duration: 11.988s, episode steps: 1940, steps per second: 162, episode reward: 17.000, mean
645219/1500000: episode: 281, duration: 11.506s, episode steps: 1853, steps per second: 161, episode reward: 19.000, mean
647657/1500000: episode: 282, duration: 14.907s, episode steps: 2438, steps per second: 164, episode reward: 12.000, mean

| | | | | | | |
|-----------------|---------------|--------------------|----------------------|------------------------|-------------------------|------|
| 650244/1500000: | episode: 283, | duration: 15.949s, | episode steps: 2587, | steps per second: 162, | episode reward: 11.000, | mean |
| 652841/1500000: | episode: 284, | duration: 16.081s, | episode steps: 2597, | steps per second: 161, | episode reward: 10.000, | mean |
| 654755/1500000: | episode: 285, | duration: 11.804s, | episode steps: 1914, | steps per second: 162, | episode reward: 19.000, | mean |
| 656741/1500000: | episode: 286, | duration: 12.121s, | episode steps: 1986, | steps per second: 164, | episode reward: 19.000, | mean |
| 658531/1500000: | episode: 287, | duration: 11.027s, | episode steps: 1790, | steps per second: 162, | episode reward: 20.000, | mean |
| 660934/1500000: | episode: 288, | duration: 14.764s, | episode steps: 2403, | steps per second: 163, | episode reward: 17.000, | mean |
| 663522/1500000: | episode: 289, | duration: 15.974s, | episode steps: 2588, | steps per second: 162, | episode reward: 16.000, | mean |
| 665686/1500000: | episode: 290, | duration: 13.362s, | episode steps: 2164, | steps per second: 162, | episode reward: 9.000, | mean |
| 667765/1500000: | episode: 291, | duration: 12.783s, | episode steps: 2079, | steps per second: 163, | episode reward: 18.000, | mean |
| 669721/1500000: | episode: 292, | duration: 11.910s, | episode steps: 1956, | steps per second: 164, | episode reward: 16.000, | mean |
| 671897/1500000: | episode: 293, | duration: 13.538s, | episode steps: 2176, | steps per second: 161, | episode reward: 16.000, | mean |
| 673987/1500000: | episode: 294, | duration: 12.978s, | episode steps: 2090, | steps per second: 161, | episode reward: 18.000, | mean |
| 675843/1500000: | episode: 295, | duration: 11.336s, | episode steps: 1856, | steps per second: 164, | episode reward: 19.000, | mean |
| 677967/1500000: | episode: 296, | duration: 13.027s, | episode steps: 2124, | steps per second: 163, | episode reward: 14.000, | mean |
| 679627/1500000: | episode: 297, | duration: 10.223s, | episode steps: 1660, | steps per second: 162, | episode reward: 21.000, | mean |
| 681580/1500000: | episode: 298, | duration: 11.948s, | episode steps: 1953, | steps per second: 163, | episode reward: 18.000, | mean |
| 683947/1500000: | episode: 299, | duration: 14.494s, | episode steps: 2367, | steps per second: 163, | episode reward: 14.000, | mean |
| 685974/1500000: | episode: 300, | duration: 12.424s, | episode steps: 2027, | steps per second: 163, | episode reward: 16.000, | mean |
| 688204/1500000: | episode: 301, | duration: 13.729s, | episode steps: 2230, | steps per second: 162, | episode reward: 16.000, | mean |
| 690272/1500000: | episode: 302, | duration: 12.673s, | episode steps: 2068, | steps per second: 163, | episode reward: 17.000, | mean |
| 692008/1500000: | episode: 303, | duration: 10.655s, | episode steps: 1736, | steps per second: 163, | episode reward: 21.000, | mean |
| 694188/1500000: | episode: 304, | duration: 13.486s, | episode steps: 2180, | steps per second: 162, | episode reward: 16.000, | mean |
| 695984/1500000: | episode: 305, | duration: 10.877s, | episode steps: 1796, | steps per second: 165, | episode reward: 19.000, | mean |
| 698365/1500000: | episode: 306, | duration: 14.603s, | episode steps: 2381, | steps per second: 163, | episode reward: 16.000, | mean |
| 700127/1500000: | episode: 307, | duration: 10.764s, | episode steps: 1762, | steps per second: 164, | episode reward: 19.000, | mean |
| 702898/1500000: | episode: 308, | duration: 16.966s, | episode steps: 2771, | steps per second: 163, | episode reward: 10.000, | mean |
| 705086/1500000: | episode: 309, | duration: 13.423s, | episode steps: 2188, | steps per second: 163, | episode reward: 17.000, | mean |
| 706747/1500000: | episode: 310, | duration: 10.131s, | episode steps: 1661, | steps per second: 164, | episode reward: 21.000, | mean |
| 708864/1500000: | episode: 311, | duration: 12.994s, | episode steps: 2117, | steps per second: 163, | episode reward: 15.000, | mean |
| 710684/1500000: | episode: 312, | duration: 11.016s, | episode steps: 1820, | steps per second: 165, | episode reward: 19.000, | mean |
| 712719/1500000: | episode: 313, | duration: 12.200s, | episode steps: 2035, | steps per second: 167, | episode reward: 19.000, | mean |
| 715317/1500000: | episode: 314, | duration: 15.818s, | episode steps: 2598, | steps per second: 164, | episode reward: 11.000, | mean |
| 717181/1500000: | episode: 315, | duration: 11.290s, | episode steps: 1864, | steps per second: 165, | episode reward: 20.000, | mean |
| 719491/1500000: | episode: 316, | duration: 14.073s, | episode steps: 2310, | steps per second: 164, | episode reward: 14.000, | mean |
| 721530/1500000: | episode: 317, | duration: 12.522s, | episode steps: 2039, | steps per second: 163, | episode reward: 17.000, | mean |
| 723713/1500000: | episode: 318, | duration: 13.634s, | episode steps: 2183, | steps per second: 160, | episode reward: 16.000, | mean |
| 726062/1500000: | episode: 319, | duration: 14.377s, | episode steps: 2349, | steps per second: 163, | episode reward: 15.000, | mean |
| 728437/1500000: | episode: 320, | duration: 14.622s, | episode steps: 2375, | steps per second: 162, | episode reward: 11.000, | mean |
| 730517/1500000: | episode: 321, | duration: 12.679s, | episode steps: 2080, | steps per second: 164, | episode reward: 18.000, | mean |
| 732428/1500000: | episode: 322, | duration: 11.673s, | episode steps: 1911, | steps per second: 164, | episode reward: 16.000, | mean |
| 734367/1500000: | episode: 323, | duration: 11.887s, | episode steps: 1939, | steps per second: 163, | episode reward: 19.000, | mean |
| 736262/1500000: | episode: 324, | duration: 11.611s, | episode steps: 1895, | steps per second: 163, | episode reward: 17.000, | mean |
| 738355/1500000: | episode: 325, | duration: 12.812s, | episode steps: 2093, | steps per second: 163, | episode reward: 18.000, | mean |
| 740018/1500000: | episode: 326, | duration: 10.215s, | episode steps: 1663, | steps per second: 163, | episode reward: 21.000, | mean |
| 742423/1500000: | episode: 327, | duration: 14.730s, | episode steps: 2405, | steps per second: 163, | episode reward: 9.000, | mean |
| 744278/1500000: | episode: 328, | duration: 11.445s, | episode steps: 1855, | steps per second: 162, | episode reward: 20.000, | mean |
| 746362/1500000: | episode: 329, | duration: 12.729s, | episode steps: 2084, | steps per second: 164, | episode reward: 15.000, | mean |
| 748096/1500000: | episode: 330, | duration: 10.553s, | episode steps: 1734, | steps per second: 164, | episode reward: 20.000, | mean |
| 750175/1500000: | episode: 331, | duration: 12.556s, | episode steps: 2079, | steps per second: 166, | episode reward: 17.000, | mean |
| 752244/1500000: | episode: 332, | duration: 12.410s, | episode steps: 2069, | steps per second: 167, | episode reward: 17.000, | mean |
| 754200/1500000: | episode: 333, | duration: 11.863s, | episode steps: 1956, | steps per second: 165, | episode reward: 18.000, | mean |
| 756899/1500000: | episode: 334, | duration: 16.316s, | episode steps: 2699, | steps per second: 165, | episode reward: 8.000, | mean |
| 758920/1500000: | episode: 335, | duration: 12.307s, | episode steps: 2021, | steps per second: 164, | episode reward: 16.000, | mean |
| 761472/1500000: | episode: 336, | duration: 15.601s, | episode steps: 2552, | steps per second: 164, | episode reward: 9.000, | mean |
| 764366/1500000: | episode: 337, | duration: 17.703s, | episode steps: 2894, | steps per second: 163, | episode reward: -1.000, | mean |
| 766693/1500000: | episode: 338, | duration: 14.323s, | episode steps: 2327, | steps per second: 162, | episode reward: 17.000, | mean |
| 769050/1500000: | episode: 339, | duration: 14.350s, | episode steps: 2357, | steps per second: 164, | episode reward: 16.000, | mean |
| 772094/1500000: | episode: 340, | duration: 18.639s, | episode steps: 3044, | steps per second: 163, | episode reward: 10.000, | mean |
| 774467/1500000: | episode: 341, | duration: 14.734s, | episode steps: 2373, | steps per second: 161, | episode reward: 14.000, | mean |
| 776634/1500000: | episode: 342, | duration: 13.334s, | episode steps: 2167, | steps per second: 163, | episode reward: 18.000, | mean |
| 778988/1500000: | episode: 343, | duration: 14.316s, | episode steps: 2354, | steps per second: 164, | episode reward: 14.000, | mean |
| 781022/1500000: | episode: 344, | duration: 12.457s, | episode steps: 2034, | steps per second: 163, | episode reward: 17.000, | mean |
| 782959/1500000: | episode: 345, | duration: 11.758s, | episode steps: 1937, | steps per second: 165, | episode reward: 20.000, | mean |
| 784892/1500000: | episode: 346, | duration: 11.736s, | episode steps: 1933, | steps per second: 165, | episode reward: 19.000, | mean |
| 787019/1500000: | episode: 347, | duration: 12.988s, | episode steps: 2127, | steps per second: 164, | episode reward: 19.000, | mean |
| 788908/1500000: | episode: 348, | duration: 11.432s, | episode steps: 1889, | steps per second: 165, | episode reward: 19.000, | mean |
| 790651/1500000: | episode: 349, | duration: 10.649s, | episode steps: 1743, | steps per second: 164, | episode reward: 20.000, | mean |
| 793145/1500000: | episode: 350, | duration: 15.359s, | episode steps: 2494, | steps per second: 162, | episode reward: 13.000, | mean |
| 795349/1500000: | episode: 351, | duration: 13.193s, | episode steps: 2204, | steps per second: 167, | episode reward: 18.000, | mean |
| 798051/1500000: | episode: 352, | duration: 16.151s, | episode steps: 2702, | steps per second: 167, | episode reward: 11.000, | mean |
| 800240/1500000: | episode: 353, | duration: 13.225s, | episode steps: 2189, | steps per second: 166, | episode reward: 19.000, | mean |
| 802794/1500000: | episode: 354, | duration: 15.416s, | episode steps: 2554, | steps per second: 166, | episode reward: 15.000, | mean |
| 805568/1500000: | episode: 355, | duration: 16.807s, | episode steps: 2774, | steps per second: 165, | episode reward: 9.000, | mean |
| 807832/1500000: | episode: 356, | duration: 13.857s, | episode steps: 2264, | steps per second: 163, | episode reward: 17.000, | mean |
| 810375/1500000: | episode: 357, | duration: 15.433s, | episode steps: 2543, | steps per second: 165, | episode reward: 12.000, | mean |
| 812442/1500000: | episode: 358, | duration: 12.609s, | episode steps: 2067, | steps per second: 164, | episode reward: 18.000, | mean |
| 814833/1500000: | episode: 359, | duration: 14.517s, | episode steps: 2391, | steps per second: 165, | episode reward: 12.000, | mean |
| 817229/1500000: | episode: 360, | duration: 14.719s, | episode steps: 2396, | steps per second: 163, | episode reward: 14.000, | mean |
| 820302/1500000: | episode: 361, | duration: 18.847s, | episode steps: 3073, | steps per second: 163, | episode reward: 9.000, | mean |
| 822736/1500000: | episode: 362, | duration: 14.953s, | episode steps: 2434, | steps per second: 163, | episode reward: 15.000, | mean |
| 824952/1500000: | episode: 363, | duration: 13.822s, | episode steps: 2216, | steps per second: 160, | episode reward: 17.000, | mean |
| 827330/1500000: | episode: 364, | duration: 14.580s, | episode steps: 2378, | steps per second: 163, | episode reward: 15.000, | mean |
| 829803/1500000: | episode: 365, | duration: 15.054s, | episode steps: 2473, | steps per second: 164, | episode reward: 16.000, | mean |
| 831673/1500000: | episode: 366, | duration: 11.452s, | episode steps: 1870, | steps per second: 163, | episode reward: 19.000, | mean |
| 834643/1500000: | episode: 367, | duration: 18.101s, | episode steps: 2970, | steps per second: 164, | episode reward: 13.000, | mean |
| 836796/1500000: | episode: 368, | duration: 13.077s, | episode steps: 2153, | steps per second: 165, | episode reward: 18.000, | mean |
| 839318/1500000: | episode: 369, | duration: 15.322s, | episode steps: 2522, | steps per second: 165, | episode reward: 15.000, | mean |
| 841602/1500000: | episode: 370, | duration: 13.981s, | episode steps: 2284, | steps per second: 163, | episode reward: 15.000, | mean |
| 843755/1500000: | episode: 371, | duration: 13.422s, | episode steps: 2153, | steps per second: 160, | episode reward: 13.000, | mean |
| 847250/1500000: | episode: 372, | duration: 21.500s, | episode steps: 3495, | steps per second: 163, | episode reward: 2.000, | mean |
| 849824/1500000: | episode: 373, | duration: 15.727s, | episode steps: 2574, | steps per second: 164, | episode reward: 8.000, | mean |
| 851681/1500000: | episode: 374, | duration: 11.399s, | episode steps: 1857, | steps per second: 163, | episode reward: 18.000, | mean |
| 853702/1500000: | episode: 375, | duration: 12.371s, | episode steps: 2021, | steps per second: 163, | episode reward: 17.000, | mean |
| 855874/1500000: | episode: 376, | duration: 13.322s, | episode steps: 2172, | steps per second: 163, | episode reward: 14.000, | mean |
| 857612/1500000: | episode: 377, | duration: 10.670s, | episode steps: 1738, | steps per second: 163, | episode reward: 20.000, | mean |

| | | | |
|------------------|----------------------------------|---|------------------------------|
| 859784/1500000: | episode: 377, duration: 13.289s, | episode steps: 2172, steps per second: 163, | episode reward: 13.000, mean |
| 862104/1500000: | episode: 379, duration: 14.129s, | episode steps: 2320, steps per second: 164, | episode reward: 15.000, mean |
| 864319/1500000: | episode: 380, duration: 13.588s, | episode steps: 2215, steps per second: 163, | episode reward: 17.000, mean |
| 866871/1500000: | episode: 381, duration: 15.549s, | episode steps: 2552, steps per second: 164, | episode reward: 17.000, mean |
| 869230/1500000: | episode: 382, duration: 14.456s, | episode steps: 2359, steps per second: 163, | episode reward: 15.000, mean |
| 871211/1500000: | episode: 383, duration: 12.201s, | episode steps: 1981, steps per second: 162, | episode reward: 18.000, mean |
| 873776/1500000: | episode: 384, duration: 15.909s, | episode steps: 2565, steps per second: 161, | episode reward: 10.000, mean |
| 875440/1500000: | episode: 385, duration: 10.268s, | episode steps: 1664, steps per second: 162, | episode reward: 21.000, mean |
| 878059/1500000: | episode: 386, duration: 15.859s, | episode steps: 2619, steps per second: 165, | episode reward: 9.000, mean |
| 880550/1500000: | episode: 387, duration: 15.137s, | episode steps: 2491, steps per second: 165, | episode reward: 15.000, mean |
| 883238/1500000: | episode: 388, duration: 16.560s, | episode steps: 2688, steps per second: 162, | episode reward: 12.000, mean |
| 885617/1500000: | episode: 389, duration: 14.939s, | episode steps: 2379, steps per second: 159, | episode reward: 14.000, mean |
| 888031/1500000: | episode: 390, duration: 15.221s, | episode steps: 2414, steps per second: 159, | episode reward: 11.000, mean |
| 890613/1500000: | episode: 391, duration: 16.057s, | episode steps: 2582, steps per second: 161, | episode reward: 17.000, mean |
| 893185/1500000: | episode: 392, duration: 16.175s, | episode steps: 2572, steps per second: 159, | episode reward: 17.000, mean |
| 894849/1500000: | episode: 393, duration: 10.311s, | episode steps: 1664, steps per second: 161, | episode reward: 21.000, mean |
| 897143/1500000: | episode: 394, duration: 14.213s, | episode steps: 2294, steps per second: 161, | episode reward: 15.000, mean |
| 898981/1500000: | episode: 395, duration: 11.372s, | episode steps: 1838, steps per second: 162, | episode reward: 20.000, mean |
| 901408/1500000: | episode: 396, duration: 14.792s, | episode steps: 2427, steps per second: 164, | episode reward: 15.000, mean |
| 904419/1500000: | episode: 397, duration: 18.656s, | episode steps: 3011, steps per second: 161, | episode reward: 9.000, mean |
| 906672/1500000: | episode: 398, duration: 14.010s, | episode steps: 2253, steps per second: 161, | episode reward: 16.000, mean |
| 908989/1500000: | episode: 399, duration: 14.565s, | episode steps: 2317, steps per second: 159, | episode reward: 16.000, mean |
| 910920/1500000: | episode: 400, duration: 12.113s, | episode steps: 1931, steps per second: 159, | episode reward: 19.000, mean |
| 913277/1500000: | episode: 401, duration: 14.756s, | episode steps: 2357, steps per second: 160, | episode reward: 13.000, mean |
| 915582/1500000: | episode: 402, duration: 14.356s, | episode steps: 2305, steps per second: 161, | episode reward: 13.000, mean |
| 917767/1500000: | episode: 403, duration: 13.276s, | episode steps: 2185, steps per second: 165, | episode reward: 15.000, mean |
| 920128/1500000: | episode: 404, duration: 14.232s, | episode steps: 2361, steps per second: 166, | episode reward: 14.000, mean |
| 922058/1500000: | episode: 405, duration: 11.736s, | episode steps: 1930, steps per second: 164, | episode reward: 19.000, mean |
| 924146/1500000: | episode: 406, duration: 13.206s, | episode steps: 2088, steps per second: 158, | episode reward: 17.000, mean |
| 926120/1500000: | episode: 407, duration: 12.206s, | episode steps: 1974, steps per second: 162, | episode reward: 17.000, mean |
| 927908/1500000: | episode: 408, duration: 10.909s, | episode steps: 1788, steps per second: 164, | episode reward: 21.000, mean |
| 929908/1500000: | episode: 409, duration: 12.342s, | episode steps: 2000, steps per second: 162, | episode reward: 18.000, mean |
| 931919/1500000: | episode: 410, duration: 12.276s, | episode steps: 2011, steps per second: 164, | episode reward: 18.000, mean |
| 934398/1500000: | episode: 411, duration: 15.149s, | episode steps: 2479, steps per second: 164, | episode reward: 13.000, mean |
| 936258/1500000: | episode: 412, duration: 11.375s, | episode steps: 1860, steps per second: 164, | episode reward: 19.000, mean |
| 938619/1500000: | episode: 413, duration: 14.293s, | episode steps: 2361, steps per second: 165, | episode reward: 16.000, mean |
| 940778/1500000: | episode: 414, duration: 13.108s, | episode steps: 2159, steps per second: 165, | episode reward: 17.000, mean |
| 943117/1500000: | episode: 415, duration: 14.335s, | episode steps: 2339, steps per second: 163, | episode reward: 15.000, mean |
| 945129/1500000: | episode: 416, duration: 12.216s, | episode steps: 2012, steps per second: 165, | episode reward: 19.000, mean |
| 947632/1500000: | episode: 417, duration: 15.186s, | episode steps: 2503, steps per second: 165, | episode reward: 12.000, mean |
| 949808/1500000: | episode: 418, duration: 13.283s, | episode steps: 2176, steps per second: 164, | episode reward: 18.000, mean |
| 952781/1500000: | episode: 419, duration: 18.076s, | episode steps: 2973, steps per second: 164, | episode reward: 13.000, mean |
| 954873/1500000: | episode: 420, duration: 12.721s, | episode steps: 2092, steps per second: 164, | episode reward: 20.000, mean |
| 957049/1500000: | episode: 421, duration: 13.158s, | episode steps: 2176, steps per second: 165, | episode reward: 14.000, mean |
| 959323/1500000: | episode: 422, duration: 13.566s, | episode steps: 2274, steps per second: 168, | episode reward: 16.000, mean |
| 961841/1500000: | episode: 423, duration: 15.206s, | episode steps: 2518, steps per second: 166, | episode reward: 8.000, mean |
| 964222/1500000: | episode: 424, duration: 14.423s, | episode steps: 2381, steps per second: 165, | episode reward: 16.000, mean |
| 966484/1500000: | episode: 425, duration: 13.725s, | episode steps: 2262, steps per second: 165, | episode reward: 18.000, mean |
| 968491/1500000: | episode: 426, duration: 12.139s, | episode steps: 2007, steps per second: 165, | episode reward: 19.000, mean |
| 970939/1500000: | episode: 427, duration: 14.932s, | episode steps: 2448, steps per second: 164, | episode reward: 14.000, mean |
| 973275/1500000: | episode: 428, duration: 14.269s, | episode steps: 2336, steps per second: 164, | episode reward: 16.000, mean |
| 975296/1500000: | episode: 429, duration: 12.611s, | episode steps: 2021, steps per second: 160, | episode reward: 19.000, mean |
| 978033/1500000: | episode: 430, duration: 16.676s, | episode steps: 2737, steps per second: 164, | episode reward: 14.000, mean |
| 980162/1500000: | episode: 431, duration: 12.982s, | episode steps: 2129, steps per second: 164, | episode reward: 17.000, mean |
| 982248/1500000: | episode: 432, duration: 12.721s, | episode steps: 2086, steps per second: 164, | episode reward: 18.000, mean |
| 984364/1500000: | episode: 433, duration: 12.775s, | episode steps: 2116, steps per second: 166, | episode reward: 19.000, mean |
| 986233/1500000: | episode: 434, duration: 11.432s, | episode steps: 1869, steps per second: 163, | episode reward: 20.000, mean |
| 987968/1500000: | episode: 435, duration: 10.591s, | episode steps: 1735, steps per second: 164, | episode reward: 20.000, mean |
| 990315/1500000: | episode: 436, duration: 14.406s, | episode steps: 2347, steps per second: 163, | episode reward: 13.000, mean |
| 992351/1500000: | episode: 437, duration: 12.645s, | episode steps: 2036, steps per second: 161, | episode reward: 17.000, mean |
| 994468/1500000: | episode: 438, duration: 12.866s, | episode steps: 2117, steps per second: 165, | episode reward: 19.000, mean |
| 996369/1500000: | episode: 439, duration: 11.603s, | episode steps: 1901, steps per second: 164, | episode reward: 17.000, mean |
| 998107/1500000: | episode: 440, duration: 10.585s, | episode steps: 1738, steps per second: 164, | episode reward: 20.000, mean |
| 999903/1500000: | episode: 441, duration: 10.836s, | episode steps: 1796, steps per second: 166, | episode reward: 20.000, mean |
| 1002062/1500000: | episode: 442, duration: 13.151s, | episode steps: 2159, steps per second: 164, | episode reward: 19.000, mean |
| 1003877/1500000: | episode: 443, duration: 10.982s, | episode steps: 1815, steps per second: 165, | episode reward: 19.000, mean |
| 1006216/1500000: | episode: 444, duration: 14.227s, | episode steps: 2339, steps per second: 164, | episode reward: 14.000, mean |
| 1008250/1500000: | episode: 445, duration: 12.409s, | episode steps: 2034, steps per second: 164, | episode reward: 17.000, mean |
| 1010403/1500000: | episode: 446, duration: 13.247s, | episode steps: 2153, steps per second: 163, | episode reward: 15.000, mean |
| 1012607/1500000: | episode: 447, duration: 13.570s, | episode steps: 2204, steps per second: 162, | episode reward: 14.000, mean |
| 1014965/1500000: | episode: 448, duration: 14.455s, | episode steps: 2358, steps per second: 163, | episode reward: 13.000, mean |
| 1016986/1500000: | episode: 449, duration: 12.390s, | episode steps: 2021, steps per second: 163, | episode reward: 16.000, mean |
| 1018868/1500000: | episode: 450, duration: 11.552s, | episode steps: 1882, steps per second: 163, | episode reward: 18.000, mean |
| 1020756/1500000: | episode: 451, duration: 11.538s, | episode steps: 1888, steps per second: 164, | episode reward: 19.000, mean |
| 1022738/1500000: | episode: 452, duration: 12.103s, | episode steps: 1982, steps per second: 164, | episode reward: 17.000, mean |
| 1024704/1500000: | episode: 453, duration: 12.095s, | episode steps: 1966, steps per second: 163, | episode reward: 18.000, mean |
| 1026515/1500000: | episode: 454, duration: 11.378s, | episode steps: 1811, steps per second: 159, | episode reward: 19.000, mean |
| 1028804/1500000: | episode: 455, duration: 14.205s, | episode steps: 2289, steps per second: 161, | episode reward: 13.000, mean |
| 1030942/1500000: | episode: 456, duration: 13.207s, | episode steps: 2138, steps per second: 162, | episode reward: 16.000, mean |
| 1033421/1500000: | episode: 457, duration: 15.352s, | episode steps: 2479, steps per second: 161, | episode reward: 14.000, mean |
| 1035220/1500000: | episode: 458, duration: 10.955s, | episode steps: 1799, steps per second: 164, | episode reward: 19.000, mean |
| 1037485/1500000: | episode: 459, duration: 13.828s, | episode steps: 2265, steps per second: 164, | episode reward: 12.000, mean |
| 1039649/1500000: | episode: 460, duration: 13.059s, | episode steps: 2164, steps per second: 166, | episode reward: 17.000, mean |
| 1041471/1500000: | episode: 461, duration: 11.147s, | episode steps: 1822, steps per second: 163, | episode reward: 19.000, mean |
| 1043517/1500000: | episode: 462, duration: 12.389s, | episode steps: 2046, steps per second: 165, | episode reward: 16.000, mean |
| 1045623/1500000: | episode: 463, duration: 12.792s, | episode steps: 2106, steps per second: 165, | episode reward: 18.000, mean |
| 1047782/1500000: | episode: 464, duration: 13.182s, | episode steps: 2159, steps per second: 164, | episode reward: 18.000, mean |
| 1049867/1500000: | episode: 465, duration: 12.757s, | episode steps: 2085, steps per second: 163, | episode reward: 18.000, mean |
| 1051959/1500000: | episode: 466, duration: 12.841s, | episode steps: 2092, steps per second: 163, | episode reward: 18.000, mean |
| 1053890/1500000: | episode: 467, duration: 11.940s, | episode steps: 1931, steps per second: 162, | episode reward: 18.000, mean |
| 1055942/1500000: | episode: 468, duration: 12.551s, | episode steps: 2052, steps per second: 163, | episode reward: 15.000, mean |
| 1057974/1500000: | episode: 469, duration: 12.398s, | episode steps: 2032, steps per second: 164, | episode reward: 19.000, mean |
| 1059637/1500000: | episode: 470, duration: 10.195s, | episode steps: 1663, steps per second: 163, | episode reward: 21.000, mean |
| 1061714/1500000: | episode: 471, duration: 12.737s, | episode steps: 2077, steps per second: 163, | episode reward: 18.000, mean |

| | |
|------------------|---|
| 1065113/1500000: | episode: 472, duration: 12.343s, episode steps: 1999, steps per second: 164, episode reward: 19.000, mean |
| 1065488/1500000: | episode: 473, duration: 10.858s, episode steps: 1775, steps per second: 163, episode reward: 19.000, mean |
| 1068046/1500000: | episode: 474, duration: 15.806s, episode steps: 2558, steps per second: 162, episode reward: 13.000, mean |
| 1071426/1500000: | episode: 475, duration: 20.709s, episode steps: 3380, steps per second: 163, episode reward: 11.000, mean |
| 1073794/1500000: | episode: 476, duration: 14.518s, episode steps: 2368, steps per second: 163, episode reward: 11.000, mean |
| 1075844/1500000: | episode: 477, duration: 12.840s, episode steps: 2050, steps per second: 160, episode reward: 12.000, mean |
| 1077807/1500000: | episode: 478, duration: 11.958s, episode steps: 1963, steps per second: 164, episode reward: 17.000, mean |
| 1079612/1500000: | episode: 479, duration: 10.913s, episode steps: 1805, steps per second: 165, episode reward: 20.000, mean |
| 1081414/1500000: | episode: 480, duration: 10.868s, episode steps: 1802, steps per second: 166, episode reward: 20.000, mean |
| 1083222/1500000: | episode: 481, duration: 10.991s, episode steps: 1808, steps per second: 165, episode reward: 20.000, mean |
| 1084886/1500000: | episode: 482, duration: 10.207s, episode steps: 1664, steps per second: 163, episode reward: 21.000, mean |
| 1087159/1500000: | episode: 483, duration: 13.950s, episode steps: 2273, steps per second: 163, episode reward: 15.000, mean |
| 1088935/1500000: | episode: 484, duration: 10.945s, episode steps: 1776, steps per second: 162, episode reward: 20.000, mean |
| 1090625/1500000: | episode: 485, duration: 10.429s, episode steps: 1690, steps per second: 162, episode reward: 21.000, mean |
| 1092383/1500000: | episode: 486, duration: 10.814s, episode steps: 1758, steps per second: 163, episode reward: 20.000, mean |
| 1094426/1500000: | episode: 487, duration: 12.675s, episode steps: 2043, steps per second: 161, episode reward: 17.000, mean |
| 1096511/1500000: | episode: 488, duration: 12.750s, episode steps: 2085, steps per second: 164, episode reward: 19.000, mean |
| 1098845/1500000: | episode: 489, duration: 14.307s, episode steps: 2334, steps per second: 163, episode reward: 9.000, mean |
| 1101438/1500000: | episode: 490, duration: 15.877s, episode steps: 2593, steps per second: 163, episode reward: 9.000, mean |
| 1103364/1500000: | episode: 491, duration: 11.746s, episode steps: 1926, steps per second: 164, episode reward: 20.000, mean |
| 1105296/1500000: | episode: 492, duration: 11.848s, episode steps: 1932, steps per second: 163, episode reward: 17.000, mean |
| 1107467/1500000: | episode: 493, duration: 13.332s, episode steps: 2171, steps per second: 163, episode reward: 18.000, mean |
| 1109498/1500000: | episode: 494, duration: 12.377s, episode steps: 2031, steps per second: 164, episode reward: 17.000, mean |
| 1112191/1500000: | episode: 495, duration: 16.411s, episode steps: 2693, steps per second: 164, episode reward: 8.000, mean |
| 1114328/1500000: | episode: 496, duration: 13.061s, episode steps: 2137, steps per second: 164, episode reward: 16.000, mean |
| 1116118/1500000: | episode: 497, duration: 10.892s, episode steps: 1790, steps per second: 164, episode reward: 20.000, mean |
| 1117997/1500000: | episode: 498, duration: 11.366s, episode steps: 1879, steps per second: 165, episode reward: 20.000, mean |
| 1119726/1500000: | episode: 499, duration: 10.549s, episode steps: 1729, steps per second: 164, episode reward: 20.000, mean |
| 1121919/1500000: | episode: 500, duration: 13.286s, episode steps: 2193, steps per second: 165, episode reward: 15.000, mean |
| 1123893/1500000: | episode: 501, duration: 11.832s, episode steps: 1974, steps per second: 167, episode reward: 18.000, mean |
| 1125996/1500000: | episode: 502, duration: 13.035s, episode steps: 2103, steps per second: 161, episode reward: 17.000, mean |
| 1128087/1500000: | episode: 503, duration: 13.035s, episode steps: 2091, steps per second: 160, episode reward: 16.000, mean |
| 1130065/1500000: | episode: 504, duration: 12.052s, episode steps: 1978, steps per second: 164, episode reward: 19.000, mean |
| 1131912/1500000: | episode: 505, duration: 11.303s, episode steps: 1847, steps per second: 163, episode reward: 20.000, mean |
| 1133859/1500000: | episode: 506, duration: 11.952s, episode steps: 1947, steps per second: 163, episode reward: 18.000, mean |
| 1135800/1500000: | episode: 507, duration: 11.888s, episode steps: 1941, steps per second: 163, episode reward: 18.000, mean |
| 1137980/1500000: | episode: 508, duration: 13.312s, episode steps: 2180, steps per second: 164, episode reward: 18.000, mean |
| 1139968/1500000: | episode: 509, duration: 12.183s, episode steps: 1988, steps per second: 163, episode reward: 17.000, mean |
| 1141886/1500000: | episode: 510, duration: 11.786s, episode steps: 1918, steps per second: 163, episode reward: 18.000, mean |
| 1143934/1500000: | episode: 511, duration: 12.415s, episode steps: 2048, steps per second: 165, episode reward: 19.000, mean |
| 1146059/1500000: | episode: 512, duration: 13.073s, episode steps: 2125, steps per second: 163, episode reward: 15.000, mean |
| 1148230/1500000: | episode: 513, duration: 13.217s, episode steps: 2171, steps per second: 164, episode reward: 18.000, mean |
| 1150233/1500000: | episode: 514, duration: 12.200s, episode steps: 2003, steps per second: 164, episode reward: 19.000, mean |
| 1151944/1500000: | episode: 515, duration: 10.510s, episode steps: 1711, steps per second: 163, episode reward: 20.000, mean |
| 1153687/1500000: | episode: 516, duration: 10.549s, episode steps: 1743, steps per second: 165, episode reward: 21.000, mean |
| 1155706/1500000: | episode: 517, duration: 12.356s, episode steps: 2019, steps per second: 163, episode reward: 19.000, mean |
| 1157578/1500000: | episode: 518, duration: 11.367s, episode steps: 1872, steps per second: 165, episode reward: 19.000, mean |
| 1159839/1500000: | episode: 519, duration: 13.769s, episode steps: 2261, steps per second: 164, episode reward: 13.000, mean |
| 1161896/1500000: | episode: 520, duration: 12.505s, episode steps: 2057, steps per second: 164, episode reward: 15.000, mean |
| 1164424/1500000: | episode: 521, duration: 15.271s, episode steps: 2528, steps per second: 166, episode reward: 12.000, mean |
| 1166680/1500000: | episode: 522, duration: 13.630s, episode steps: 2256, steps per second: 166, episode reward: 16.000, mean |
| 1168923/1500000: | episode: 523, duration: 13.619s, episode steps: 2243, steps per second: 165, episode reward: 14.000, mean |
| 1170779/1500000: | episode: 524, duration: 11.314s, episode steps: 1856, steps per second: 164, episode reward: 19.000, mean |
| 1173183/1500000: | episode: 525, duration: 14.714s, episode steps: 2404, steps per second: 163, episode reward: 15.000, mean |
| 1175429/1500000: | episode: 526, duration: 13.699s, episode steps: 2246, steps per second: 164, episode reward: 13.000, mean |
| 1177426/1500000: | episode: 527, duration: 12.584s, episode steps: 1997, steps per second: 159, episode reward: 18.000, mean |
| 1179530/1500000: | episode: 528, duration: 12.822s, episode steps: 2104, steps per second: 164, episode reward: 16.000, mean |
| 1181549/1500000: | episode: 529, duration: 12.404s, episode steps: 2019, steps per second: 163, episode reward: 19.000, mean |
| 1183904/1500000: | episode: 530, duration: 14.553s, episode steps: 2355, steps per second: 162, episode reward: 16.000, mean |
| 1185776/1500000: | episode: 531, duration: 11.756s, episode steps: 1872, steps per second: 159, episode reward: 19.000, mean |
| 1188185/1500000: | episode: 532, duration: 14.922s, episode steps: 2409, steps per second: 161, episode reward: 13.000, mean |
| 1189913/1500000: | episode: 533, duration: 10.893s, episode steps: 1728, steps per second: 159, episode reward: 21.000, mean |
| 1191657/1500000: | episode: 534, duration: 11.007s, episode steps: 1744, steps per second: 158, episode reward: 21.000, mean |
| 1193733/1500000: | episode: 535, duration: 12.804s, episode steps: 2076, steps per second: 162, episode reward: 17.000, mean |
| 1196080/1500000: | episode: 536, duration: 14.559s, episode steps: 2347, steps per second: 161, episode reward: 12.000, mean |
| 1197998/1500000: | episode: 537, duration: 12.031s, episode steps: 1918, steps per second: 159, episode reward: 19.000, mean |
| 1199849/1500000: | episode: 538, duration: 11.601s, episode steps: 1851, steps per second: 160, episode reward: 19.000, mean |
| 1201511/1500000: | episode: 539, duration: 10.394s, episode steps: 1662, steps per second: 160, episode reward: 21.000, mean |
| 1203480/1500000: | episode: 540, duration: 12.304s, episode steps: 1969, steps per second: 160, episode reward: 19.000, mean |
| 1206385/1500000: | episode: 541, duration: 18.234s, episode steps: 2905, steps per second: 159, episode reward: 11.000, mean |
| 1208323/1500000: | episode: 542, duration: 12.021s, episode steps: 1938, steps per second: 161, episode reward: 16.000, mean |
| 1210287/1500000: | episode: 543, duration: 12.389s, episode steps: 1964, steps per second: 159, episode reward: 18.000, mean |
| 1212299/1500000: | episode: 544, duration: 12.684s, episode steps: 2012, steps per second: 159, episode reward: 17.000, mean |
| 1214472/1500000: | episode: 545, duration: 13.506s, episode steps: 2173, steps per second: 161, episode reward: 16.000, mean |
| 1216483/1500000: | episode: 546, duration: 12.330s, episode steps: 2011, steps per second: 163, episode reward: 17.000, mean |
| 1218483/1500000: | episode: 547, duration: 12.182s, episode steps: 2000, steps per second: 164, episode reward: 20.000, mean |
| 1220444/1500000: | episode: 548, duration: 11.934s, episode steps: 1961, steps per second: 164, episode reward: 16.000, mean |
| 1222377/1500000: | episode: 549, duration: 11.803s, episode steps: 1933, steps per second: 164, episode reward: 19.000, mean |
| 1224394/1500000: | episode: 550, duration: 12.348s, episode steps: 2017, steps per second: 163, episode reward: 17.000, mean |
| 1226695/1500000: | episode: 551, duration: 14.275s, episode steps: 2301, steps per second: 161, episode reward: 19.000, mean |
| 1228460/1500000: | episode: 552, duration: 10.777s, episode steps: 1765, steps per second: 164, episode reward: 20.000, mean |
| 1230476/1500000: | episode: 553, duration: 12.246s, episode steps: 2016, steps per second: 165, episode reward: 19.000, mean |
| 1232444/1500000: | episode: 554, duration: 11.950s, episode steps: 1968, steps per second: 165, episode reward: 17.000, mean |
| 1234497/1500000: | episode: 555, duration: 12.477s, episode steps: 2053, steps per second: 165, episode reward: 17.000, mean |
| 1236324/1500000: | episode: 556, duration: 11.170s, episode steps: 1827, steps per second: 164, episode reward: 18.000, mean |
| 1238605/1500000: | episode: 557, duration: 13.900s, episode steps: 2281, steps per second: 164, episode reward: 13.000, mean |
| 1240359/1500000: | episode: 558, duration: 10.705s, episode steps: 1754, steps per second: 164, episode reward: 20.000, mean |
| 1243071/1500000: | episode: 559, duration: 16.391s, episode steps: 2712, steps per second: 165, episode reward: 13.000, mean |
| 1244923/1500000: | episode: 560, duration: 11.103s, episode steps: 1852, steps per second: 167, episode reward: 18.000, mean |
| 1247064/1500000: | episode: 561, duration: 12.780s, episode steps: 2141, steps per second: 168, episode reward: 16.000, mean |
| 1248957/1500000: | episode: 562, duration: 11.314s, episode steps: 1893, steps per second: 167, episode reward: 18.000, mean |
| 1250837/1500000: | episode: 563, duration: 11.451s, episode steps: 1880, steps per second: 164, episode reward: 18.000, mean |
| 1253005/1500000: | episode: 564, duration: 13.178s, episode steps: 2168, steps per second: 165, episode reward: 17.000, mean |
| 1255187/1500000: | episode: 565, duration: 13.177s, episode steps: 2182, steps per second: 166, episode reward: 16.000, mean |
| 1257652/1500000: | episode: 566, duration: 15.029s, episode steps: 2465, steps per second: 164, episode reward: 16.000, mean |


```

1260246/1500000: episode: 567, duration: 15.734s, episode steps: 2594, steps per second: 165, episode reward: 13.000, mean
1262069/1500000: episode: 568, duration: 11.056s, episode steps: 1823, steps per second: 165, episode reward: 19.000, mean
1264328/1500000: episode: 569, duration: 13.836s, episode steps: 2259, steps per second: 163, episode reward: 18.000, mean
1266349/1500000: episode: 570, duration: 12.205s, episode steps: 2021, steps per second: 166, episode reward: 19.000, mean
1269156/1500000: episode: 571, duration: 16.897s, episode steps: 2807, steps per second: 166, episode reward: 8.000, mean
1271244/1500000: episode: 572, duration: 12.486s, episode steps: 2088, steps per second: 167, episode reward: 18.000, mean
1273916/1500000: episode: 573, duration: 16.314s, episode steps: 2672, steps per second: 164, episode reward: 11.000, mean
1275779/1500000: episode: 574, duration: 11.361s, episode steps: 1863, steps per second: 164, episode reward: 18.000, mean
1278116/1500000: episode: 575, duration: 14.692s, episode steps: 2337, steps per second: 159, episode reward: 15.000, mean
1280498/1500000: episode: 576, duration: 14.494s, episode steps: 2382, steps per second: 164, episode reward: 14.000, mean
1282457/1500000: episode: 577, duration: 11.875s, episode steps: 1959, steps per second: 165, episode reward: 18.000, mean
1284325/1500000: episode: 578, duration: 11.306s, episode steps: 1868, steps per second: 165, episode reward: 19.000, mean
1286459/1500000: episode: 579, duration: 12.858s, episode steps: 2134, steps per second: 166, episode reward: 18.000, mean
1288454/1500000: episode: 580, duration: 12.087s, episode steps: 1995, steps per second: 165, episode reward: 16.000, mean
1290116/1500000: episode: 581, duration: 10.160s, episode steps: 1662, steps per second: 164, episode reward: 21.000, mean
1292188/1500000: episode: 582, duration: 12.431s, episode steps: 2072, steps per second: 167, episode reward: 16.000, mean
1294211/1500000: episode: 583, duration: 12.329s, episode steps: 2023, steps per second: 164, episode reward: 18.000, mean
1296023/1500000: episode: 584, duration: 11.021s, episode steps: 1812, steps per second: 164, episode reward: 20.000, mean
1298099/1500000: episode: 585, duration: 12.623s, episode steps: 2076, steps per second: 164, episode reward: 17.000, mean
1300506/1500000: episode: 586, duration: 14.737s, episode steps: 2407, steps per second: 163, episode reward: 13.000, mean
1302996/1500000: episode: 587, duration: 15.072s, episode steps: 2490, steps per second: 165, episode reward: 12.000, mean
1305103/1500000: episode: 588, duration: 12.818s, episode steps: 2107, steps per second: 164, episode reward: 17.000, mean
1306904/1500000: episode: 589, duration: 10.870s, episode steps: 1801, steps per second: 166, episode reward: 20.000, mean
1309350/1500000: episode: 590, duration: 14.967s, episode steps: 2446, steps per second: 163, episode reward: 13.000, mean
1311541/1500000: episode: 591, duration: 13.266s, episode steps: 2191, steps per second: 165, episode reward: 17.000, mean
1313365/1500000: episode: 592, duration: 11.118s, episode steps: 1824, steps per second: 164, episode reward: 19.000, mean
1315564/1500000: episode: 593, duration: 13.468s, episode steps: 2199, steps per second: 163, episode reward: 17.000, mean
1318401/1500000: episode: 594, duration: 17.284s, episode steps: 2837, steps per second: 164, episode reward: 11.000, mean
1320269/1500000: episode: 595, duration: 11.346s, episode steps: 1868, steps per second: 165, episode reward: 19.000, mean
1322691/1500000: episode: 596, duration: 14.679s, episode steps: 2422, steps per second: 165, episode reward: 15.000, mean
1324997/1500000: episode: 597, duration: 13.996s, episode steps: 2306, steps per second: 165, episode reward: 15.000, mean
1327710/1500000: episode: 598, duration: 16.478s, episode steps: 2713, steps per second: 165, episode reward: 16.000, mean
1329657/1500000: episode: 599, duration: 12.198s, episode steps: 1947, steps per second: 160, episode reward: 20.000, mean
1331319/1500000: episode: 600, duration: 9.977s, episode steps: 1662, steps per second: 167, episode reward: 21.000, mean
1333304/1500000: episode: 601, duration: 12.069s, episode steps: 1985, steps per second: 164, episode reward: 17.000, mean
1335691/1500000: episode: 602, duration: 14.465s, episode steps: 2387, steps per second: 165, episode reward: 14.000, mean
1338200/1500000: episode: 603, duration: 15.370s, episode steps: 2509, steps per second: 163, episode reward: 13.000, mean
1340177/1500000: episode: 604, duration: 12.235s, episode steps: 1977, steps per second: 162, episode reward: 19.000, mean
1342180/1500000: episode: 605, duration: 12.241s, episode steps: 2003, steps per second: 164, episode reward: 18.000, mean
1344332/1500000: episode: 606, duration: 13.138s, episode steps: 2152, steps per second: 164, episode reward: 18.000, mean
1347020/1500000: episode: 607, duration: 16.422s, episode steps: 2688, steps per second: 164, episode reward: 14.000, mean
1349571/1500000: episode: 608, duration: 15.606s, episode steps: 2551, steps per second: 163, episode reward: 14.000, mean
1351652/1500000: episode: 609, duration: 12.809s, episode steps: 2081, steps per second: 162, episode reward: 17.000, mean
1353842/1500000: episode: 610, duration: 13.337s, episode steps: 2190, steps per second: 164, episode reward: 19.000, mean
1356303/1500000: episode: 611, duration: 15.118s, episode steps: 2461, steps per second: 163, episode reward: 16.000, mean
1358155/1500000: episode: 612, duration: 11.305s, episode steps: 1852, steps per second: 164, episode reward: 19.000, mean
1360069/1500000: episode: 613, duration: 11.727s, episode steps: 1914, steps per second: 163, episode reward: 17.000, mean
1362456/1500000: episode: 614, duration: 14.743s, episode steps: 2387, steps per second: 162, episode reward: 15.000, mean
done, took 8353.004 seconds
Pesos guardados en: 202001111607_dqn_PongDeterministic-v0_weights.h5f
Testing for 3 episodes ...
Episode 1: reward: 17.000, steps: 2113
Episode 2: reward: 19.000, steps: 1906
Episode 3: reward: 19.000, steps: 2315

```

▼ Pruebas de los entrenamientos

Aquí varias opciones de probar las redes.

1. Test del último entrenamiento
2. Cargando unos pesos guardados
3. Hacer un video de una prueba realizada con los últimos pesos almacenados

▼ Test del último entrenamiento

```

1 from statistics import mean
2 # Probamos
3 nb_episodes = 10
4 pruebas=dqn.test(env, nb_episodes=nb_episodes, visualize=False)
5
6 #print(x.history.keys())
7
8 mean_reward = mean(pruebas.history.get('episode_reward'))
9 mean_steps = mean(pruebas.history.get('nb_steps'))
10 print('mean_reward:',mean_reward)
11 print('mean_steps:',mean_steps)
12

```



```
12
13 #202001091918_dqn_final_exp_1.h5f
```

```
↳ Testing for 10 episodes ...
Episode 1: reward: 19.000, steps: 1990
Episode 2: reward: 20.000, steps: 1764
Episode 3: reward: 18.000, steps: 2138
Episode 4: reward: 18.000, steps: 1819
Episode 5: reward: 16.000, steps: 2190
Episode 6: reward: 19.000, steps: 2112
Episode 7: reward: 19.000, steps: 1767
Episode 8: reward: 15.000, steps: 2069
Episode 9: reward: 20.000, steps: 1837
Episode 10: reward: 21.000, steps: 1922
mean_reward: 18.5
mean_steps: 1960.8
```

▼ Cargando el último archivo de pesos guardados

```
1 # Hacer el test sin video con los últimos pesos guardados
2 import glob
3 #env.reset()
4 # cargar pesos
5 #pesos_mas_recientes = max(glob.glob('*.h5f'))
6 pesos_mas_recientes = '/content/201912152017_weights-improvement-136-12.00.hdf5'
7 pesos_mas_recientes = BASE_FOLDER + '202001091918_dqn_final_exp_1_double_dqn.h5f'
8 print('Cargando los pesos:', pesos_mas_recientes)
9
10 # Testing con pesos guardados
11 nb_episodes = 1
12 dqn.load_weights(pesos_mas_recientes)
13 pruebas=dqn.test(env, nb_episodes=nb_episodes, visualize=False)
14
15 print(pruebas.history.keys())
16
17 #grafica_entrenamiento(pruebas)
18 #print(x.history.keys())
19
20 mean_reward = mean(pruebas.history.get('episode_reward'))
21 mean_steps = mean(pruebas.history.get('nb_steps'))
22
23 # /content/201912152017_weights-improvement-136-12.00.hdf5 da +12!!!
```

```
↳ Cargando los pesos: /content/drive/My Drive/MAIR-Master/07MAIR-Actividad2/202001091918_dqn_final_exp_1_double_dqn.h5f
Testing for 1 episodes ...
Episode 1: reward: -14.000, steps: 1781
dict_keys(['episode_reward', 'nb_steps'])
```

▼ Visualizando:

El siguiente código hace una prueba con los últimos pesos almacenados y direcciona el juego y lo graba en un video que muestra al final. Así podemos ir viendo las estrategias que se van descubriendo.

Para usar esta sección hay que instalar las dependencias ejecutando las celdas de código extra al final de este notebook

```
1 # Testing con video
2 #display.start()
3
4 import glob
5
6 # ver si hay archivos de pesos guardados (h5f)
7 pesos_guardados = glob.glob('*.h5f')
8 if len(pesos_guardados):
9     pesos_mas_recientes = max(pesos_guardados)
10    #pesos_mas_recientes = '/content/201912151921_weights-improvement-73-13.00.hdf5'
11    print('Cargando los pesos:', pesos_mas_recientes)
12    env = wrap_env(gym.make(ENV_NAME))
13    #observation = env.reset()
14    #env.render()
15
16 # Testing con pesos guardados
17 nb_episodes = 1
18 dqn.load_weights(pesos_mas_recientes)
19
20 dqn.test(env, nb_episodes=nb_episodes, visualize=False, verbose=2)
21 env.close()
22 show_video()
23
24
```

```
↳
```