In [25]:
```
%cd ..
```

```
C:\Users\alexa\Documents
```

In [15]:
```
%load_ext autoreload
%autoreload 2

import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline

from IPython import display
from lib.viz import showarray

import os, time, json, io

import logging
logger = logging.getLogger()

import lib.init
from lib.run import find_model, mk_env_agent, nsteps_env_agent
from lib.dashboard import get_episode_dashboard
from lib.pyb.eos3d import EyeOnStickEnv3D
```

```
The autoreload extension is already loaded. To reload it, use:
  %reload_ext autoreload
```

In [ ]:
```

```

In [16]:
```
import pandas as pd
import seaborn as sns
```

In [17]:
```
env_class = EyeOnStickEnv3D
model_name='eos3d.6j-coarse-aim'
model_version = None
gui = False
```

In [18]:
```
registered_model = find_model(model_name, model_version=model_version)
print(registered_model)
```

```
<ModelVersion: creation_timestamp=1616789697781, current_stage='None', description=None, last_u
pdated_timestamp=1616789697781, name='eos3d.6j-coarse-aim', run_id='e5e61bc4891a495ba6bb2b453c0
8506d', run_link=None, source='.\\mlruns\\3\\93762e91c9764017912a26bc0ea3bf50\\artifacts\\saved
_models/85', status='READY', status_message=None, tags={}, user_id=None, version=145>
```

In [19]:
```
nsteps = 150
```

In [ ]:
```

```

In [20]:
```
def run(params, ntargetsposes, gearfuncs, nsteps):
    env, model = mk_env_agent(env_class, registered_model, params, gui=gui)

    df = []
    for tp in range(ntargetsposes):
        env.reset() # random target position and manipulator pose

        target_pos = env.env_method('get_target')[0] # we sample one env
```

```
        pose = env.env_method('get_pose')[0]
        #print(f"targetpose {tp} of {ntargetsposes}")

        for (i, (gf_name, gf)) in enumerate(gearfuncs):
            env.env_method('set_gearfunc', gf)
            env.env_method('reset', pose=pose, target_pos=target_pos)

            ninfos = nsteps_env_agent(env, model, nsteps)[3]

            _df = pd.DataFrame(ninfos).assign(gf=gf_name)
            df.append(_df)

    env.close()
    env = model = None

    df = pd.concat(df)
    return df
```

Experiment 1

In [21]:

```
gearfuncs = [
    ('lin',  lambda phi: phi),
    ('tanh', lambda phi: np.tanh(phi)),
    ('square', lambda phi: np.square(phi)),
]

palette ={"lin": "green", "tanh": "blue", "square": "orange"}

def run_ex1():
    df = run(params={'NJ': 6, 'NP': 4}, ntargetsposes = 100, gearfuncs=gearfuncs, nsteps=nsteps

    df["alpha"] *= 180 / np.pi
    df["eye_level"] *= 180/np.pi

    return df
```

In [31]:

```
if False:
    df = run_df()
    df.to_pickle("exp0326\\exp0326-df.pkl")
else:
    df = pd.read_pickle("exp0326\\exp0326-df.pkl")
```

In [32]:

```
df
```

Out[32]:

	alpha	eye_level	reward	gf
0	104.490079	80.564389	0	lin
1	104.474186	80.836120	0	lin
2	103.694703	78.671793	0	lin
3	102.147644	75.459833	0	lin
4	99.891591	71.846406	0	lin
...	...	...	...	...
145	63.011428	9.686099	0	square
146	62.321030	10.187579	0	square
147	61.746882	10.396318	0	square

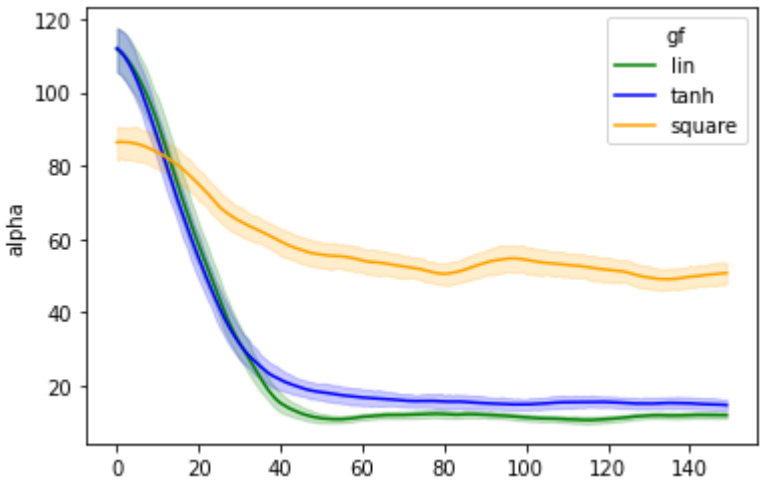
	alpha	eye_level	reward	gf
148	61.369426	10.332288	0	square
149	61.559933	10.441407	0	square

45000 rows × 4 columns

доверительный интервал альфы и угла атаки, на 150 шагов

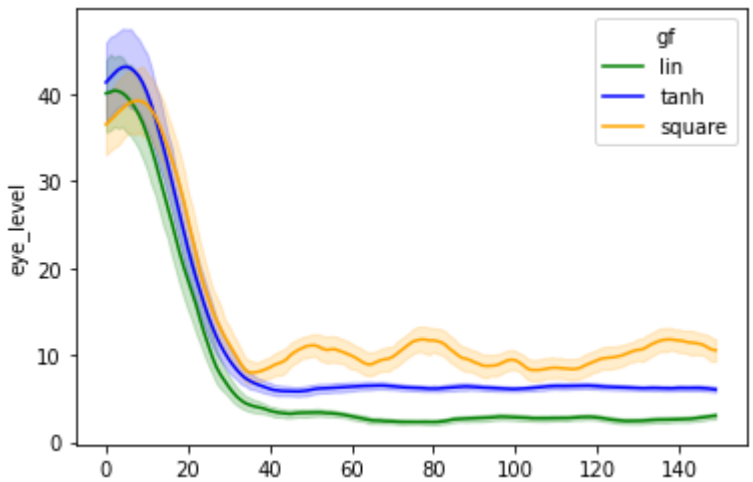
In [33]:
```
sns.lineplot(x=df.index, y="alpha", hue="gf", palette=palette, data=df)
```

Out[33]: <AxesSubplot:ylabel='alpha'>



In [34]:
```
sns.lineplot(x=df.index, y="eye_level", hue="gf", palette=palette, data=df)
```

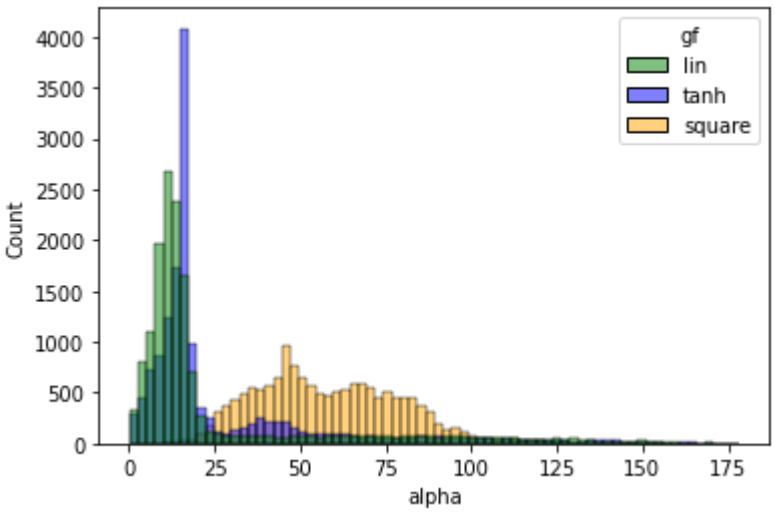
Out[34]: <AxesSubplot:ylabel='eye_level'>



распределение альф в зависимости от типа нелинейности

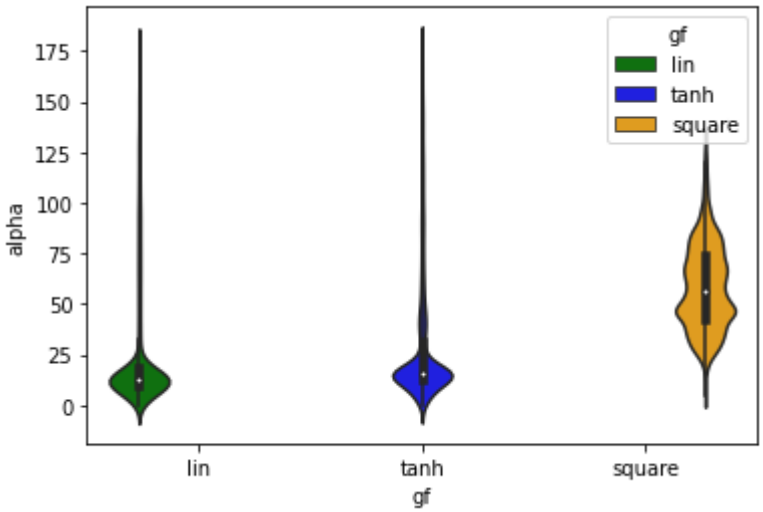
In [35]:
```
sns.histplot(x="alpha", hue="gf", palette=palette, data=df)
```

Out[35]: <AxesSubplot:xlabel='alpha', ylabel='Count'>



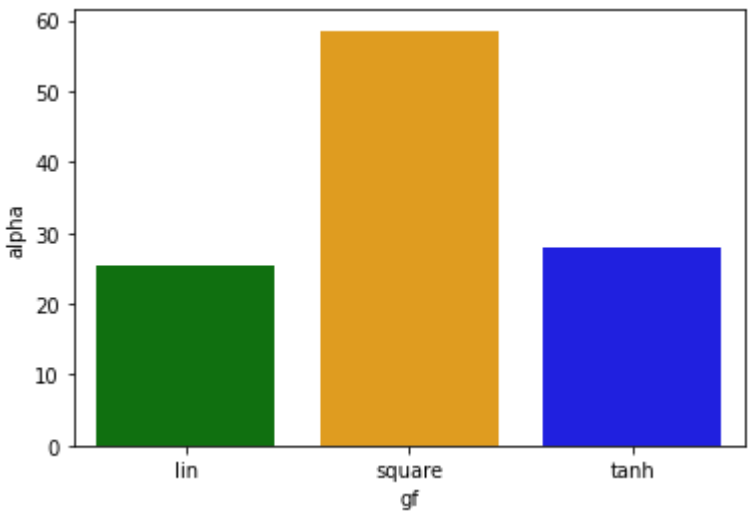
In [36]:
```
sns.violinplot(x="gf", y="alpha", hue="gf", palette=palette, data=df)
```

Out[36]: <AxesSubplot:xlabel='gf', ylabel='alpha'>



In [37]:
```
sns.barplot(x="gf", y="alpha", palette=palette, data=pd.DataFrame(df.groupby('gf')['alpha'].mea
```

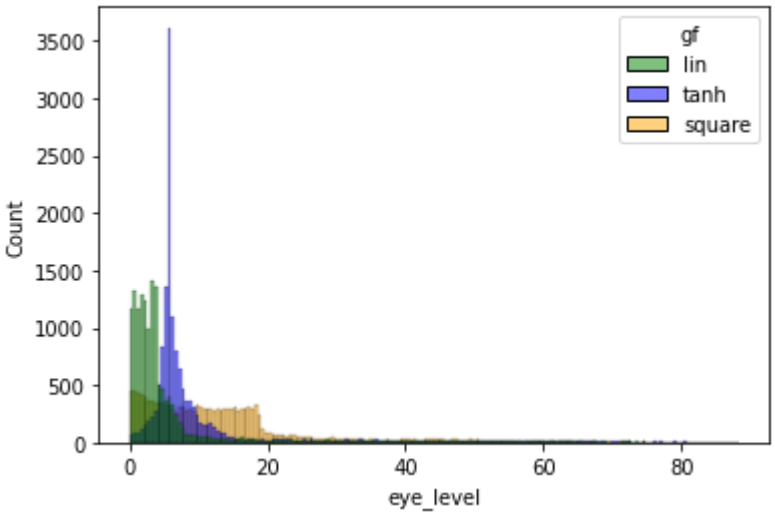
Out[37]: <AxesSubplot:xlabel='gf', ylabel='alpha'>



распределение углов атаки

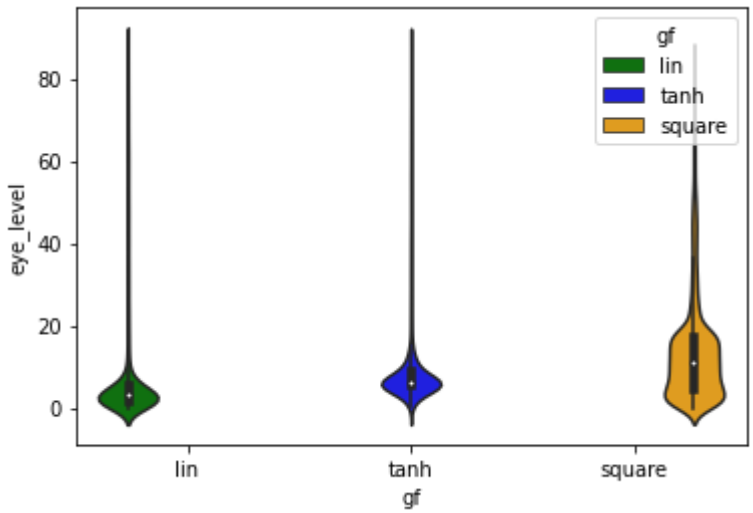
In [38]:
```
sns.histplot(data=df, x="eye_level", palette=palette, hue="gf")
```

Out[38]: <AxesSubplot:xlabel='eye_level', ylabel='Count'>



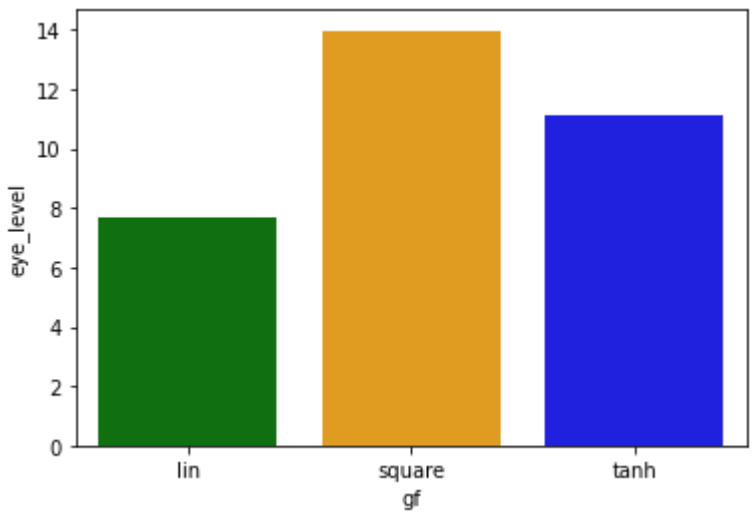
In [39]:
```
sns.violinplot(x="gf", y="eye_level", palette=palette, hue="gf", data=df)
```

Out[39]: <AxesSubplot:xlabel='gf', ylabel='eye_level'>



In [40]:
```
sns.barplot(x="gf", y="eye_level", palette=palette, data=pd.DataFrame(df.groupby('gf')['eye_lev
```

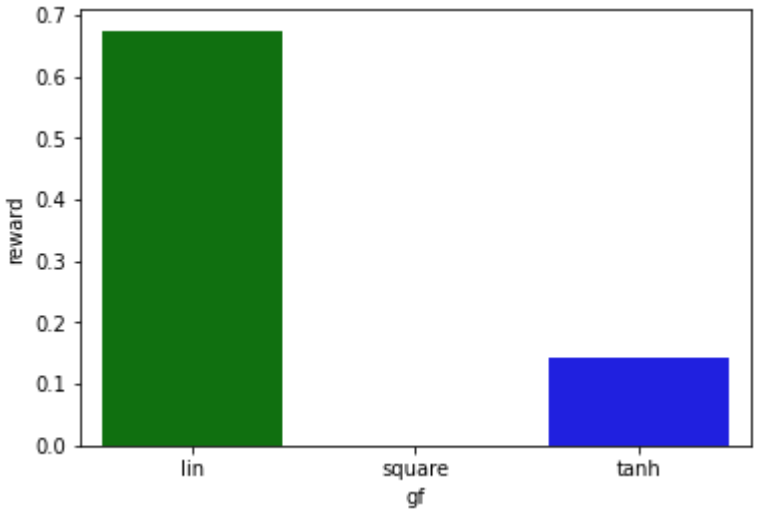
Out[40]: <AxesSubplot:xlabel='gf', ylabel='eye_level'>



распределение кумулятивной награды по gf

In [54]:
```
sns.barplot(x="gf", y="reward", palette=palette, data=pd.DataFrame(df.groupby('gf')['reward'].m
```

Out[54]: <AxesSubplot:xlabel='gf', ylabel='reward'>



In [ ]:

In [ ]:

Experiment 2

Убираем параболу, добавляем 2 вариации по количеству сегментов

In [42]:
```
gearfuncs2 = [
    ('lin',  lambda phi: phi),
    ('tanh', lambda phi: np.tanh(phi)),
]

def run_ex2():
    df2 = pd.DataFrame()
    for ns in [1, 2, 4]:
        print('ns=', ns)
        _df = run(params={'NJ': 6, 'NP': ns}, ntargetsposes = 100, gearfuncs=gearfuncs2, nsteps
        df2 = pd.concat((df2, _df.assign(ns=ns)))

    df2["gf*ns"] = df2["gf"] + df2["ns"].astype(str)
    df2["alpha"] *= 180 / np.pi
    df2["eye_level"] *= 180/np.pi

    return df2

palette2 = dict(zip(["lin1", "lin2", "lin4", "tanh1", "tanh2", "tanh4"], sns.color_palette("cre
```

In [43]:
```
if False:
    df2 = run_df()
    df2.to_pickle("exp0326\\exp0326-df2.pkl")
else:
    df2 = pd.read_pickle("exp0326\\exp0326-df2.pkl")
```

In [44]:
```
df2
```

Out[44]:

	alpha	eye_level	reward	gf	ns	gf*+ns	gf*ns	gfns
0	143.786504	37.479930	0	lin	1	lin1	lin1	lin1

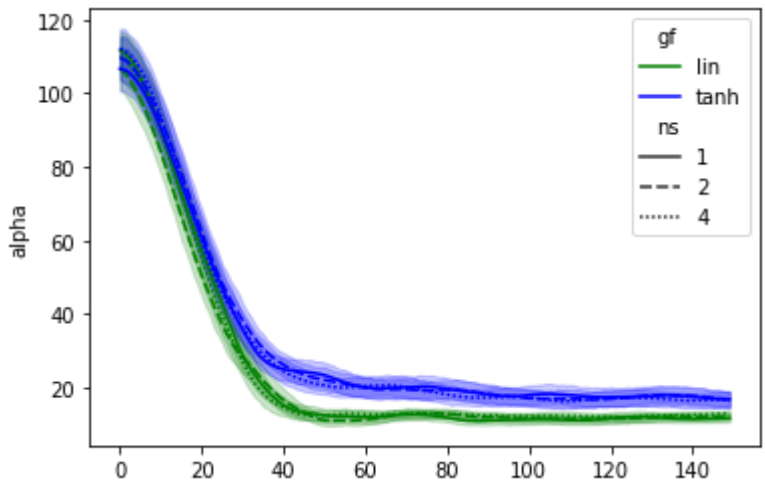
	alpha	eye_level	reward	gf	ns	gf*+ns	gf*ns	gfns
1	143.866354	35.908103	0	lin	1	lin1	lin1	lin1
2	143.525884	35.452484	0	lin	1	lin1	lin1	lin1
3	142.770613	36.117772	0	lin	1	lin1	lin1	lin1
4	141.601081	37.831846	0	lin	1	lin1	lin1	lin1
...	...	...	...	...	...	...	...	...
145	7.453550	7.657939	0	tanh	4	tanh4	tanh4	tanh4
146	6.557562	7.482108	0	tanh	4	tanh4	tanh4	tanh4
147	5.905248	7.328748	0	tanh	4	tanh4	tanh4	tanh4
148	5.617735	7.232604	0	tanh	4	tanh4	tanh4	tanh4
149	5.610537	7.188615	0	tanh	4	tanh4	tanh4	tanh4

90000 rows × 8 columns

доверительный интервал альфы и угла атаки, на 150 шагов

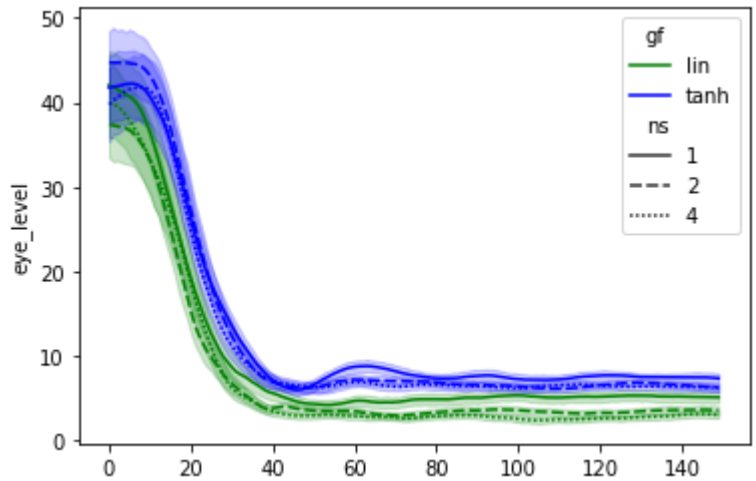
In [45]:
```
sns.lineplot(x=df2.index, y="alpha", hue="gf", style="ns", palette=palette, data=df2)
```

Out[45]:
```
<AxesSubplot:ylabel='alpha'>
```



In [46]:
```
sns.lineplot(x=df2.index, y="eye_level", hue="gf", style="ns", palette=palette, data=df2)
```

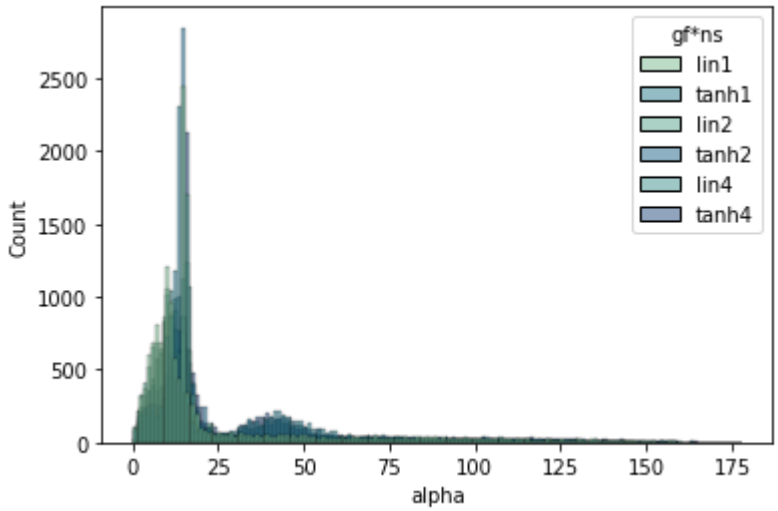
Out[46]:
```
<AxesSubplot:ylabel='eye_level'>
```



распределение альф в зависимости от типа нелинейности

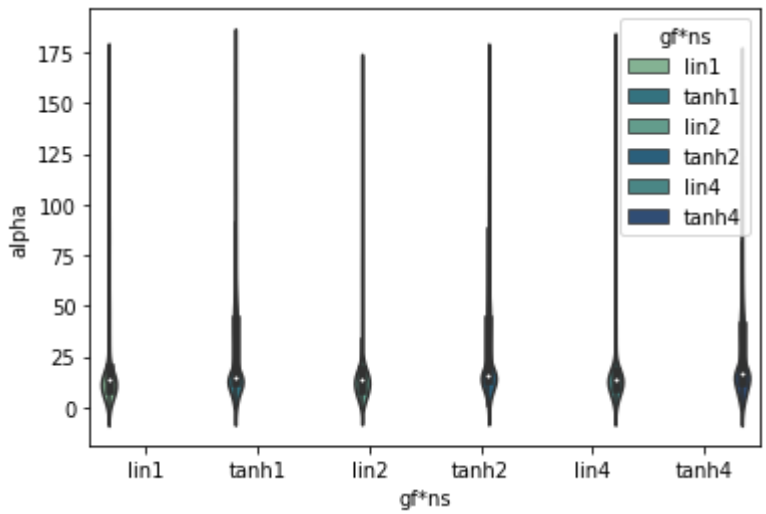
In [47]:
```
sns.histplot(x="alpha", hue="gf*ns", palette=palette2, data=df2)
```

Out[47]:
```
<AxesSubplot:xlabel='alpha', ylabel='Count'>
```



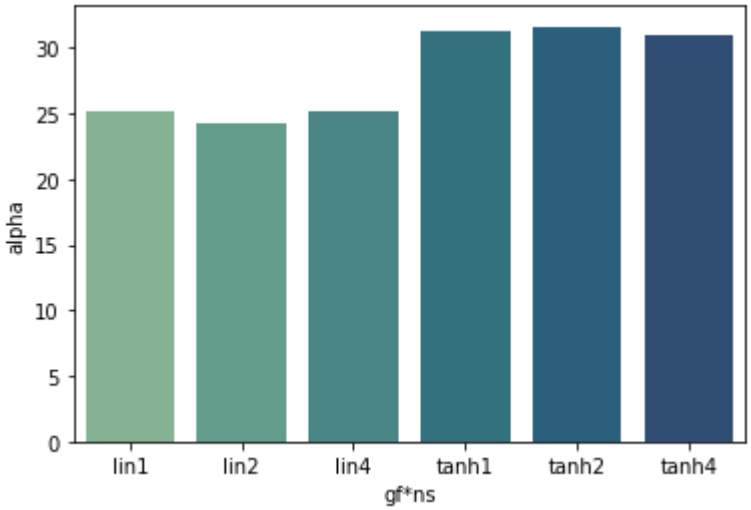
In [48]:
```
sns.violinplot(x="gf*ns", y="alpha", hue="gf*ns", palette=palette2, data=df2)
```

Out[48]:
```
<AxesSubplot:xlabel='gf*ns', ylabel='alpha'>
```



In [49]:
```
sns.barplot(x="gf*ns", y="alpha", palette=palette2, data=pd.DataFrame(df2.groupby('gf*ns')['alp
```

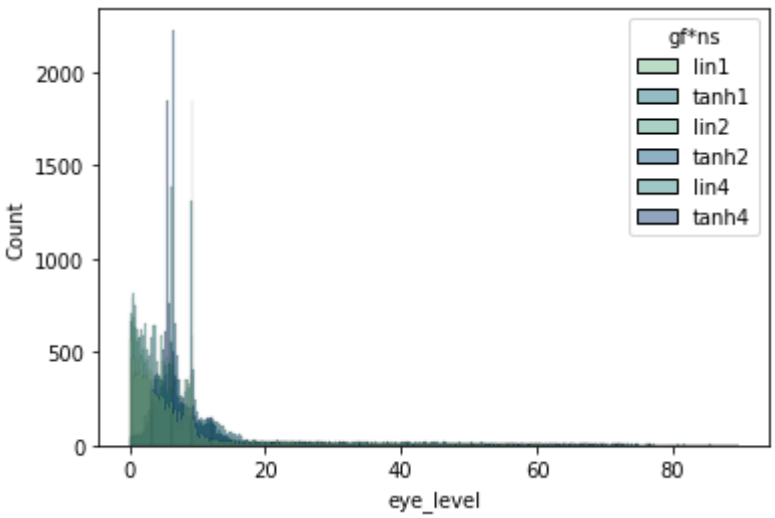
Out[49]:
```
<AxesSubplot:xlabel='gf*ns', ylabel='alpha'>
```



распределение углов атаки

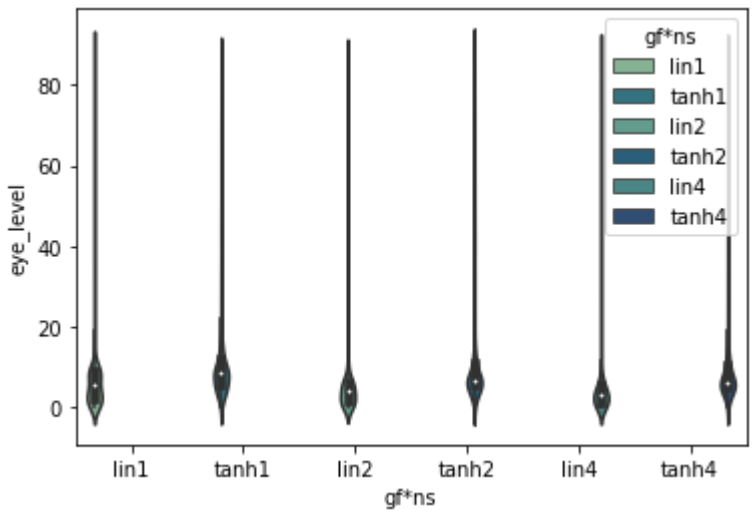
In [50]:
```
sns.histplot(x="eye_level", hue="gf*ns", palette=palette2, data=df2)
```

Out[50]:
```
<AxesSubplot:xlabel='eye_level', ylabel='Count'>
```



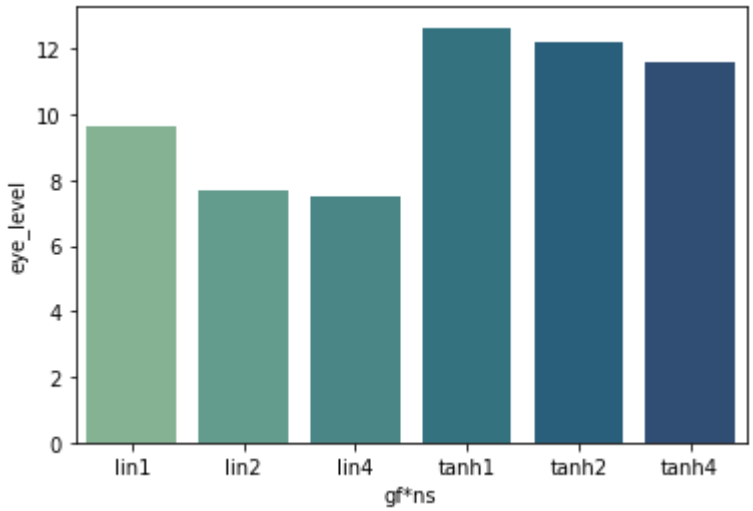
In [51]:
```
sns.violinplot(x="gf*ns", y="eye_level", hue="gf*ns", palette=palette2, data=df2)
```

Out[51]:
```
<AxesSubplot:xlabel='gf*ns', ylabel='eye_level'>
```



In [52]:
```
sns.barplot(x="gf*ns", y="eye_level", palette=palette2, data=pd.DataFrame(df2.groupby('gf*ns')[
```

Out[52]: <AxesSubplot:xlabel='gf*ns', ylabel='eye_level'>

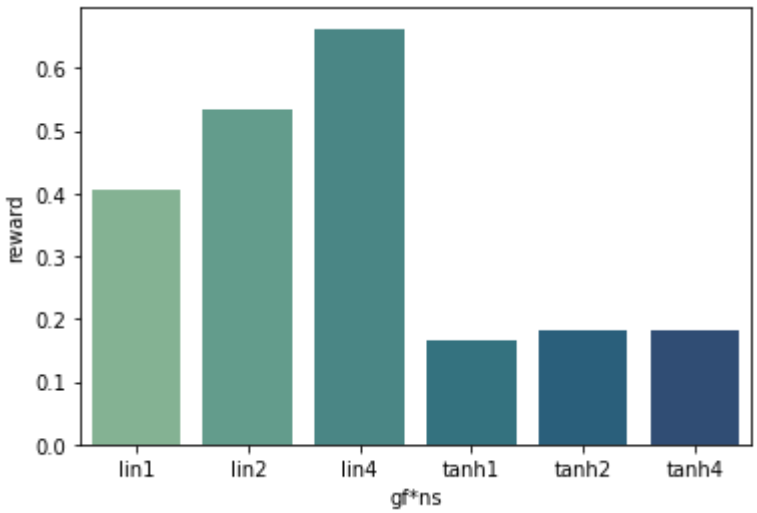


In [ ]:

распределение кумулятивной награды по gf

In [53]:
```
sns.barplot(x="gf*ns", y="reward", palette=palette2, data=pd.DataFrame(df2.groupby('gf*ns')['re
```

Out[53]: <AxesSubplot:xlabel='gf*ns', ylabel='reward'>



In [ ]: