In [64]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

In [65]:
```
df = pd.read_csv("haberman.csv",header=None)
df.columns = ["age", "year_of_operation", "aux_nodes", "survival"]
```

In [66]:
```
df.head()
```

Out[66]:

	age	year_of_operation	aux_nodes	survival
0	30	64	1	1
1	30	62	3	1
2	30	65	0	1
3	31	59	2	1
4	31	65	4	1

In [67]:
```
df.describe()
```

Out[67]:

	age	year_of_operation	aux_nodes	survival
count	306.000000	306.000000	306.000000	306.000000
mean	52.457516	62.852941	4.026144	1.264706
std	10.803452	3.249405	7.189654	0.441899
min	30.000000	58.000000	0.000000	1.000000
25%	44.000000	60.000000	0.000000	1.000000
50%	52.000000	63.000000	1.000000	1.000000
75%	60.750000	65.750000	4.000000	2.000000
max	83.000000	69.000000	52.000000	2.000000

In [68]:
```
df.shape
```

Out[68]: (306, 4)

In [69]:
```
print (df.columns)
```

```
Index(['age', 'year_of_operation', 'aux_nodes', 'survival'], dtype='object')
```

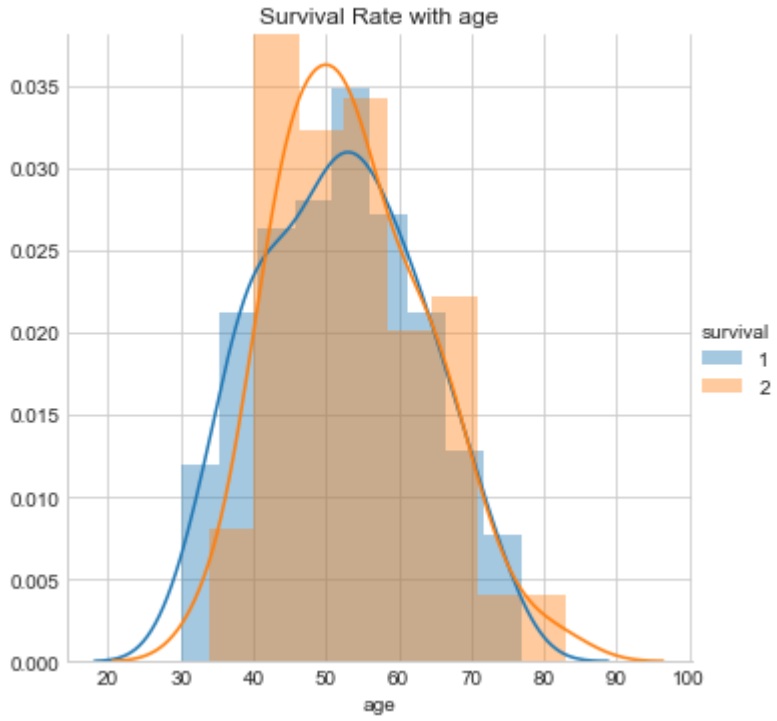
In [70]:
```
1 df["survival"].value_counts()
```

Out[70]:
```
1    225
2     81
Name: survival, dtype: int64
```

Objective:

The objective is to classify the cancer patients who died or survived if 30,64,1 are given as independent variables.

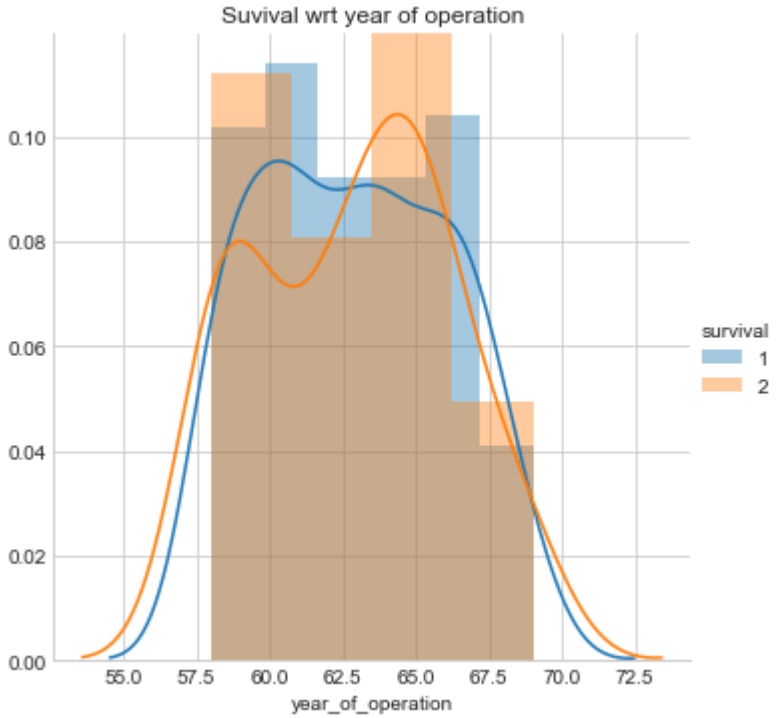
In [63]:
```
1 sns.FacetGrid(df, hue="survival", size=5) \
2    .map(sns.distplot, "age") \
3    .add_legend();
4 plt.title('Survival Rate with age')
5 plt.show();
```



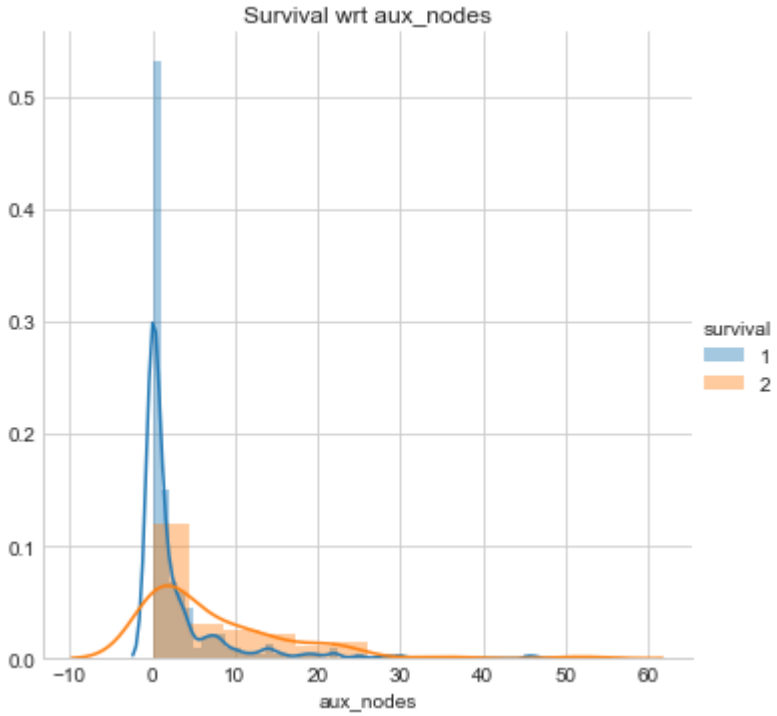
Observation:

The patients who are operated between the age of 30 to 40 has surivied most

In [72]:
```
sns.FacetGrid(df, hue="survival", size=5) \
   .map(sns.distplot, "year_of_operation") \
   .add_legend();
plt.title('Suvival wrt year of operation')
plt.show();
```



In [73]:
```
sns.FacetGrid(df, hue="survival", size=5) \
   .map(sns.distplot, "aux_nodes") \
   .add_legend();
plt.title('Survival wrt aux_nodes')
plt.show();
```



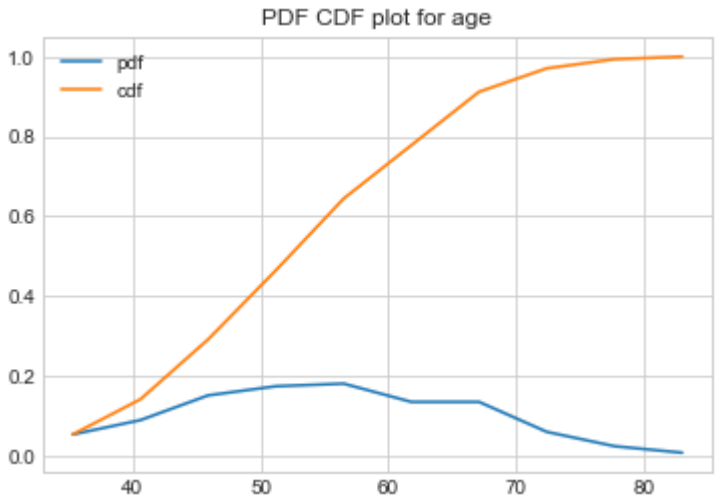
Observation:

Patients with 0 to 2 aux nodes survived most.

In [74]:
```
counts, bin_edges = np.histogram(df['age'], bins=10,
                                 density = True)
print(counts)
print(sum(counts))
pdf = counts/(sum(counts))
print(pdf);
print(bin_edges);
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf,label='pdf');
plt.plot(bin_edges[1:], cdf,label='cdf')
plt.legend()
plt.title("PDF CDF plot for age")

plt.show();
```

```
[0.00986558 0.01664817 0.02836355 0.03267974 0.03391294 0.02528055
 0.02528055 0.01109878 0.00431619 0.0012332 ]
0.18867924528301888
[0.05228758 0.08823529 0.1503268  0.17320261 0.17973856 0.13398693
 0.13398693 0.05882353 0.02287582 0.00653595]
[30.  35.3 40.6 45.9 51.2 56.5 61.8 67.1 72.4 77.7 83. ]
```



In [75]:
```
survied = df.loc[df["survival"] == 1];
died = df.loc[df["survival"] == 2];
```

In [76]:
```
1 survied.head()
```

Out[76]:

	age	year_of_operation	aux_nodes	survival
0	30	64	1	1
1	30	62	3	1
2	30	65	0	1
3	31	59	2	1
4	31	65	4	1

In [77]:
```
1 died.head()
```

Out[77]:

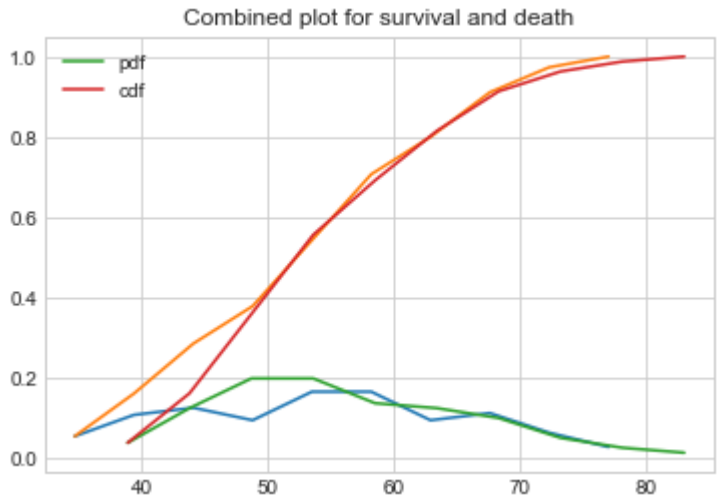
	age	year_of_operation	aux_nodes	survival
7	34	59	0	2
8	34	66	9	2
24	38	69	21	2
34	39	66	0	2
43	41	60	23	2

In [78]:
```
counts, bin_edges = np.histogram(survied['age'], bins=10,
                                 density = True)
#Survival
pdf = counts/(sum(counts))
print(pdf);
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:], cdf)


# Death
counts, bin_edges = np.histogram(died['age'], bins=10,
                                 density = True)
pdf = counts/(sum(counts))
print(pdf);
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf,label='pdf')
plt.plot(bin_edges[1:], cdf,label='cdf')
plt.legend()
plt.title('Combined plot for survival and death')

plt.show();
```

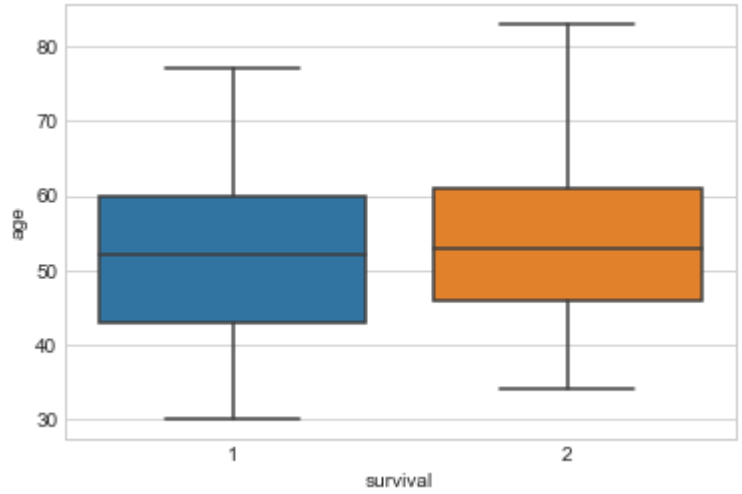
```
[0.05333333 0.10666667 0.12444444 0.09333333 0.16444444 0.16444444
 0.09333333 0.11111111 0.06222222 0.02666667]
[30.  34.7 39.4 44.1 48.8 53.5 58.2 62.9 67.6 72.3 77. ]
[0.03703704 0.12345679 0.19753086 0.19753086 0.13580247 0.12345679
 0.09876543 0.04938272 0.02469136 0.01234568]
[34.  38.9 43.8 48.7 53.6 58.5 63.4 68.3 73.2 78.1 83. ]
```



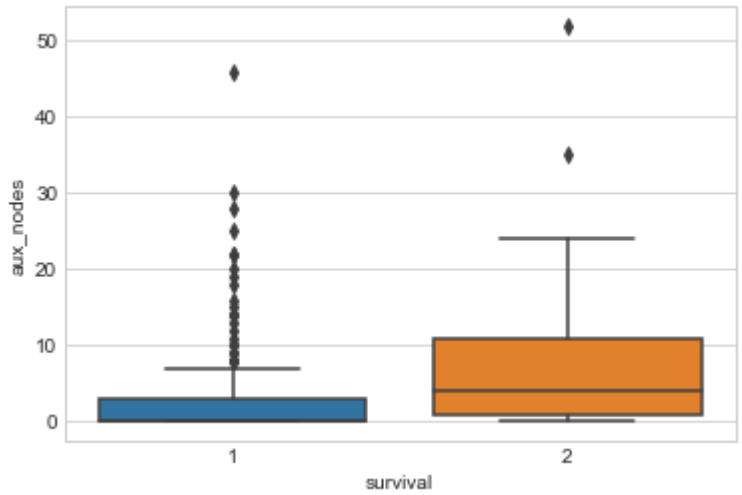
Observation:

The patients who are operated within 40 years out of them only 1% survived Survival rate is high for the patients who are operated after 48 years.

In [79]:
```
sns.boxplot(x='survival',y='age', data=df)
plt.show()
```



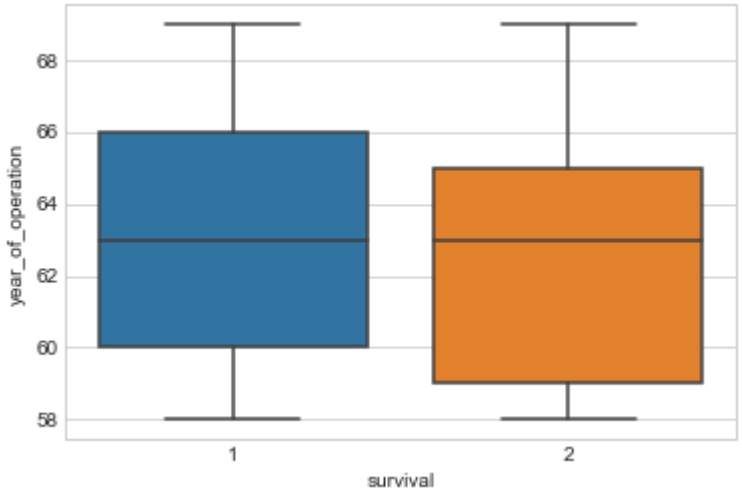
In [80]:
```
sns.boxplot(x='survival',y='aux_nodes', data=df)
plt.show()
```



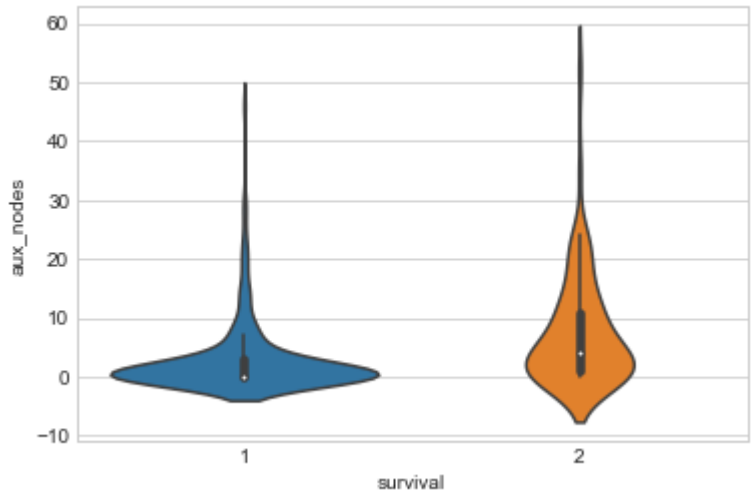
Observation:

Eventhough there are more aux nodes still patients survived more than 5 year. It shows more outliers. But we can not eleminate them

In [81]:
```
sns.boxplot(x='survival',y='year_of_operation', data=df)
plt.show()
```



In [82]:
```
sns.violinplot(x="survival", y="aux_nodes", data=df, size=8)
plt.show()
```



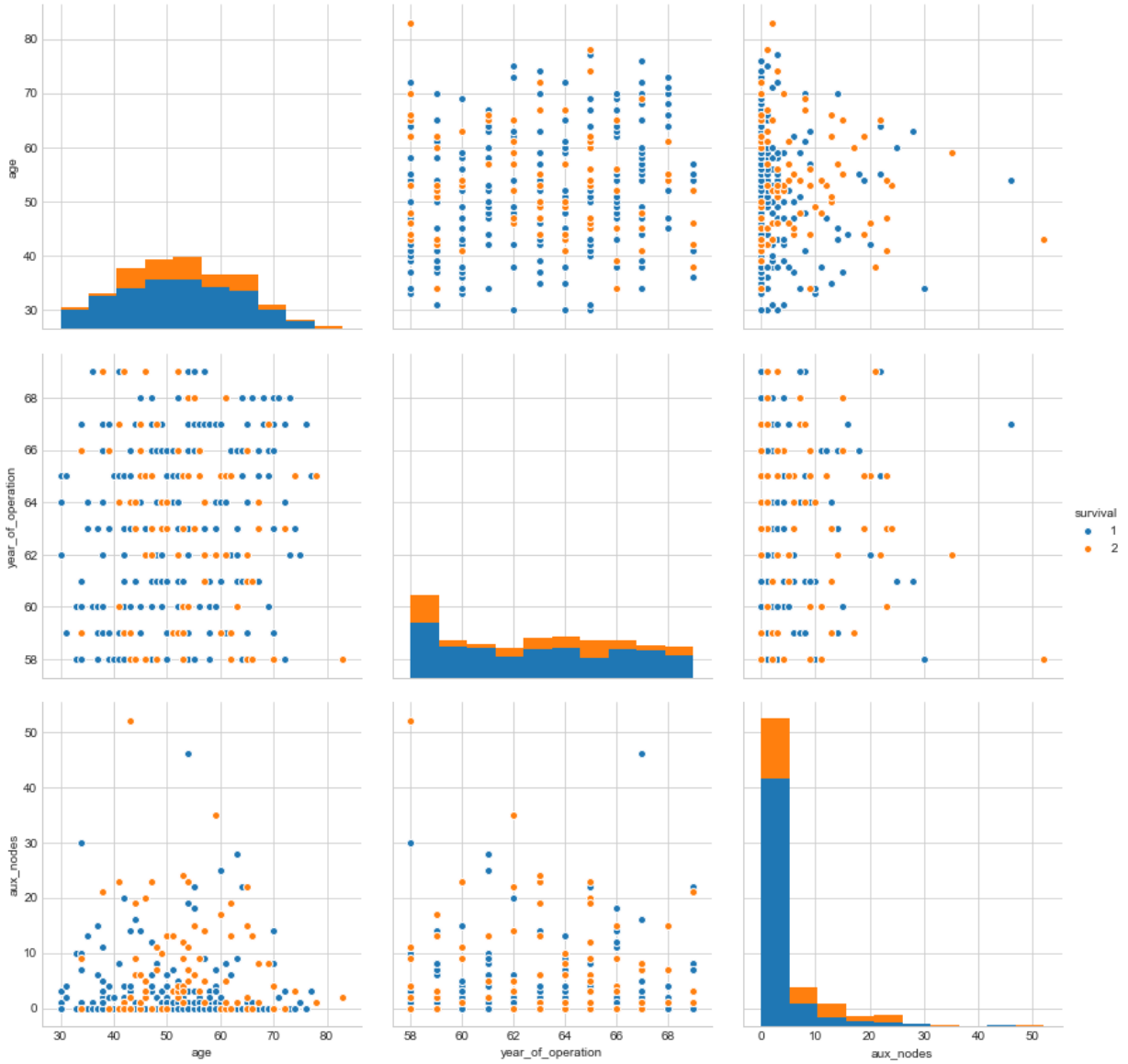
observation:

lesser no of aux nodes the survival rate is more. The area is densed near lesser nodes.

In [83]:
```
df.columns
```

Out[83]:
```
Index(['age', 'year_of_operation', 'aux_nodes', 'survival'], dtype='object')
```

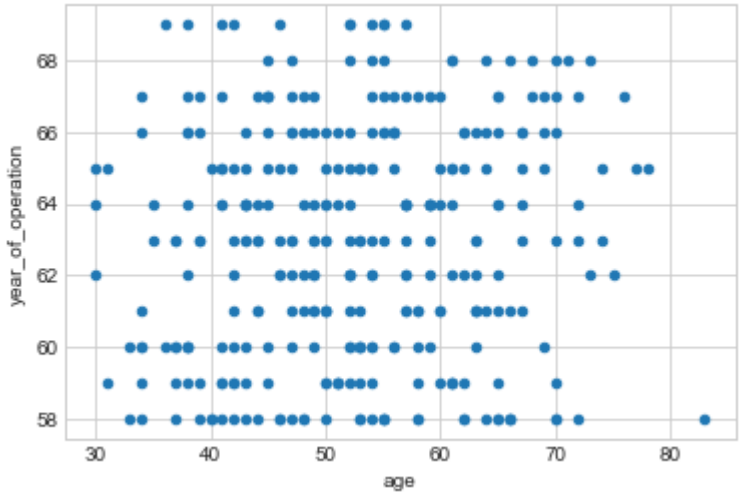
In [84]:
```
sns.pairplot(df, hue="survival",vars=['age','year_of_operation','aux_nodes'],
plt.show()
```



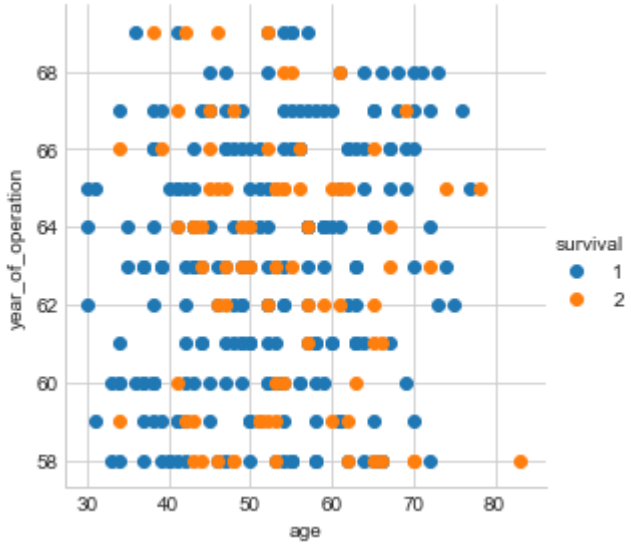
Observation:

Does not reveal any information about the dependency between the variables.

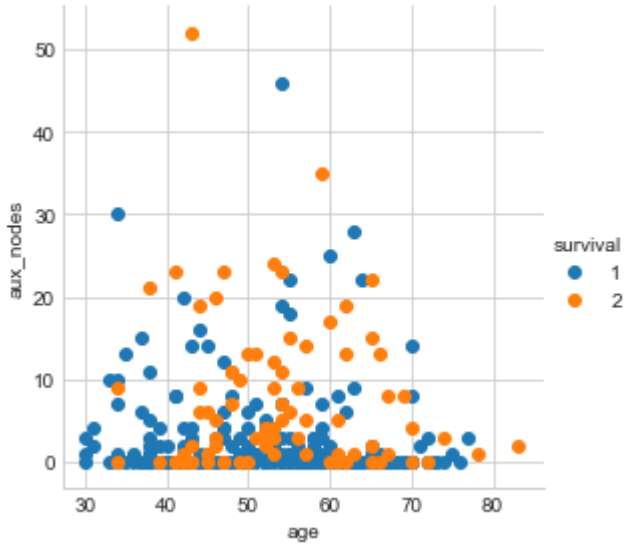
In [85]:
```
df.plot(kind="scatter",x="age",y="year_of_operation")
plt.show()
```



In [86]:
```
sns.set_style("whitegrid")
sns.FacetGrid(df,hue="survival",size=4)\
    .map(plt.scatter,"age","year_of_operation")\
    .add_legend()
plt.show()
```



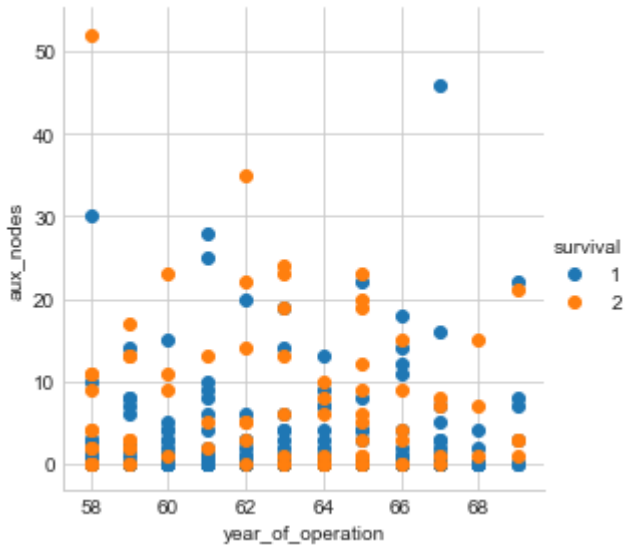
In [87]:
```
sns.set_style("whitegrid")
sns.FacetGrid(df,hue="survival",size=4)\
    .map(plt.scatter,"age","aux_nodes")\
    .add_legend()
plt.show()
```



Observation:

Death rate is high with aux_nodes if age > 30 years.

In [57]:
```
sns.set_style("whitegrid")
sns.FacetGrid(df,hue="survival",size=4)\
    .map(plt.scatter,"year_of_operation","aux_nodes")\
    .add_legend()
plt.show()
```



Observation:

Death rate is high for the age 65 if operated. 61 age is highest survival rate.

In [ ]:
```
1
```