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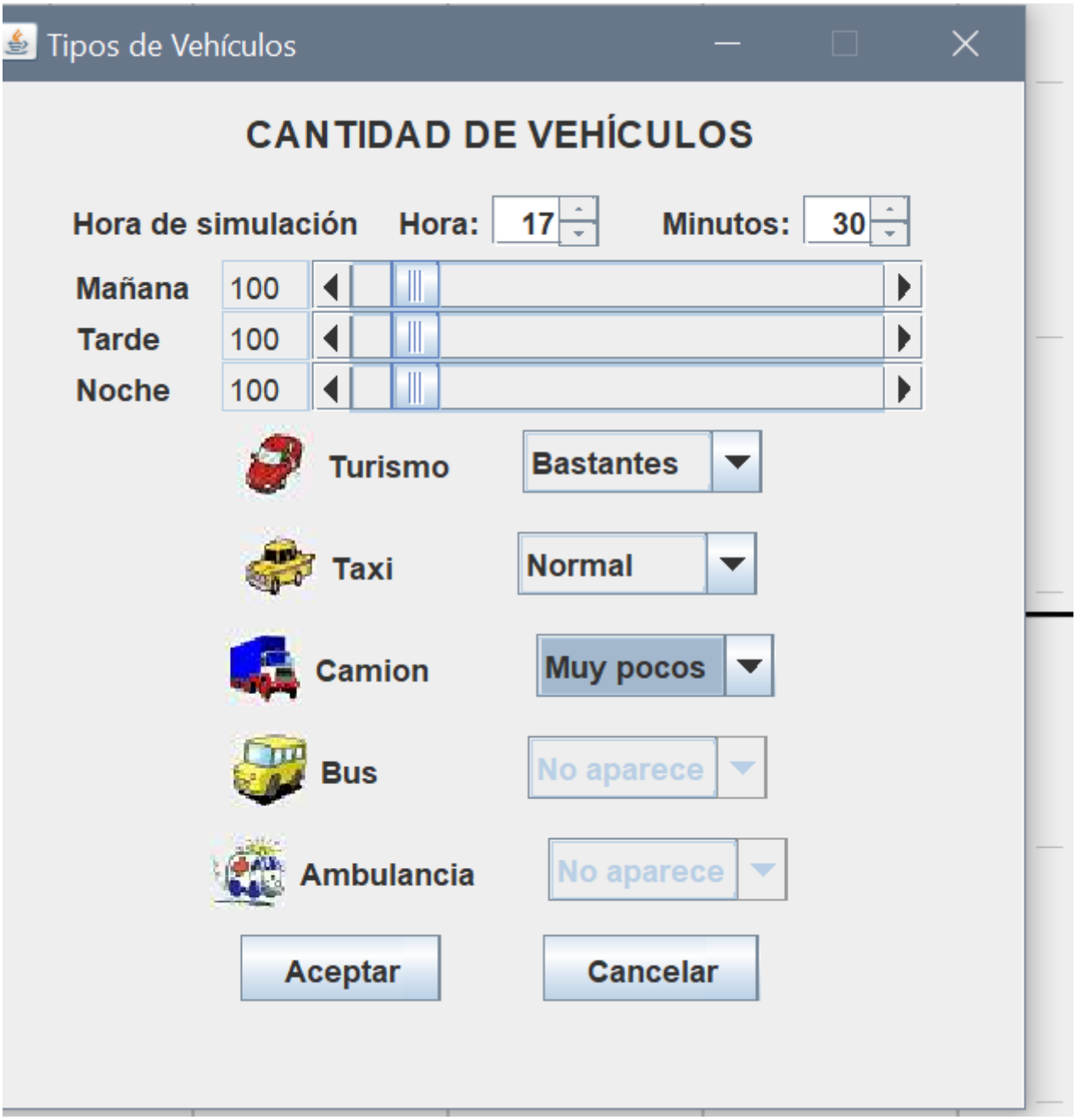
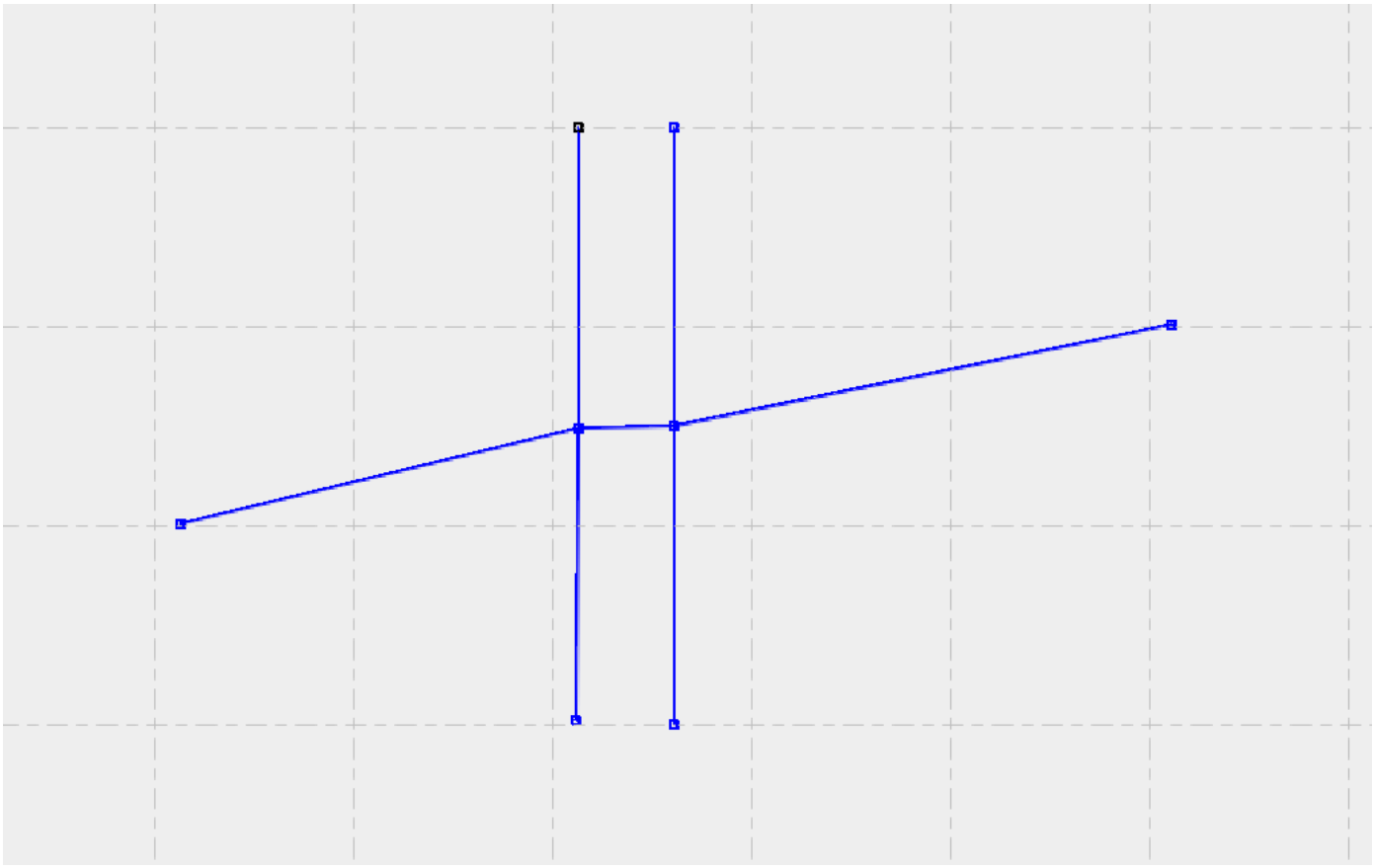
Fecha: 2/5/2021

Simulación de movimiento de vehiculos en la Ciudad de Cuenca, entre la Av. Loja y 10 de agosto.

Configuración de vehiculos para simulación.



Mapa de simulación de avenidas en SimTrafic.



Resultado de la simulación.

Fuente de datos: http://201.159.222.99/bitstream/datos/7226/1/13172.pdf (http://201.159.222.99/bitstream/datos/7226/1/13172.pdf)

In [115]:

```
import pandas as pd
import numpy as np
from datetime import datetime, timedelta
from sklearn.metrics import mean_squared_error
from scipy.optimize import curve_fit
from scipy.optimize import fsolve
from sklearn import linear_model
import matplotlib.pyplot as plt
%matplotlib inline
```

In [116]:

```
url = "datos.csv"
df = pd.read_csv(url,sep="\;")
df
```

260	Yemen, Rep. del	YEM	Exportaciones de bienes y servicios (% del PIB)	NE.EXP.GNFS.ZS	NaN	NaN	NaN	NaN	I
261	Sud frica	ZAF	Exportaciones de bienes y servicios (% del PIB)	NE.EXP.GNFS.ZS	29.550915	29.323968	29.406919	28.613876	27.435
262	Zambia	ZMB	Exportaciones de bienes y servicios (% del PIB)	NE.EXP.GNFS.ZS	NaN	NaN	NaN	NaN	I
263	Zimbabwe	ZWE	Exportaciones de bienes y servicios (% del PIB)	NE.EXP.GNFS.ZS	NaN	NaN	NaN	NaN	I

264 rows × 65 columns

In [117]:

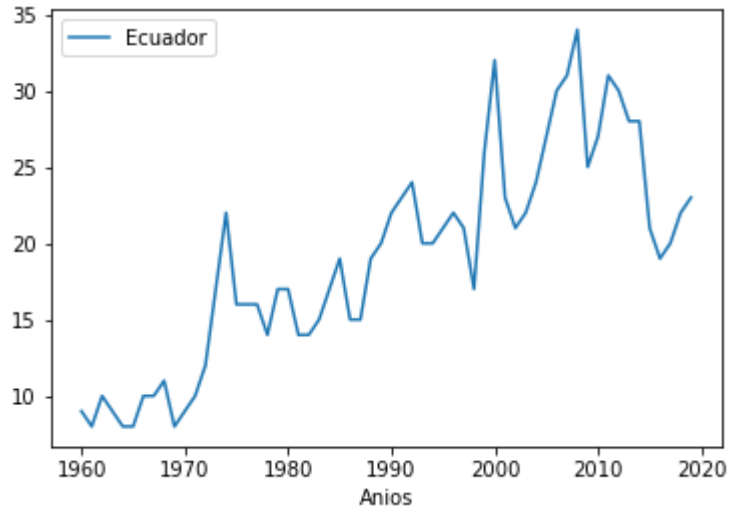
```
df = df[df['Name'].isin(['Ecuador'])]

df = df.loc[:,['Name','1960','1961','1962','1963','1964','1965','1966','1967','1968',\
            '1968','1969','1970','1971','1972','1973','1974','1975','1976',\
            '1977','1978','1979','1980','1981','1982','1983','1984','1985',\
            '1986','1987','1988','1989','1990','1991','1992','1993','1994',\
            '1995','1996','1997','1998','1999','2000','2001','2002','2003',\
            '2004','2005','2006','2007','2008','2009','2010','2011','2012',\
            '2013','2014','2015','2016','2017','2018','2019']]
df = df.set_index('Name').T

ecua = df["Ecuador"].astype(int)
df['Ecuador'] = ecua
anios = df['Ecuador'].index.tolist()
df['Anios'] = anios
an = df["Anios"].astype(int)
df["Anios"] = an
```

In [118]:

```
df.plot(y="Ecuador", x="Anios")
```

Out[118]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x158c5c55430>
```



Y = mX + b

In [119]:

```
x = list(df.iloc [:, 0])
y = list(df.iloc [:, 1])

regr = linear_model.LinearRegression()

regr.fit(np.array(x).reshape(-1, 1), y)

print('Coeficintes: \n',regr.coef_)

print("Independiente termino: \n",regr.intercept_)
```

```
Coeficintes:
 [2.13272535]
Independiente termino:
 1948.9404237135661
```

In [120]:

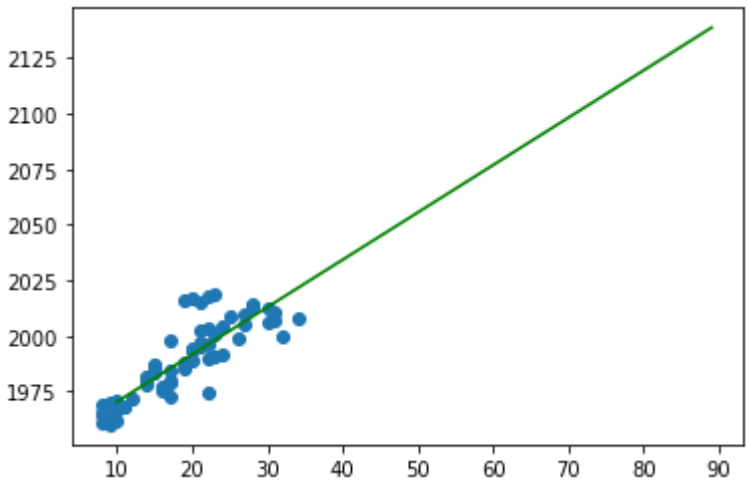
```
y_prediccion = regr.predict([[100]])
print(int(y_prediccion))
```

2162

In [121]:

```
plt.scatter(x,y)
x_real = np.array(range(10,90))
print(x_real)
plt.plot(x_real, regr.predict(x_real.reshape(-1,1)), color='green')
plt.show()
```

```
[10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33
 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81
 82 83 84 85 86 87 88 89]
```



In [122]:

```
1 y
```

Out[122]:

```
[1960,
 1961,
 1962,
 1963,
 1964,
 1965,
 1966,
 1967,
 1968,
 1968,
 1969,
 1970,
 1971,
 1972,
 1973,
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 2003,
 2004,
 2005,
 2006,
 2007,
 2008,
 2009,
 2010,
 2011,
 2012,
```

```
2013,
2014,
2015,
2016,
2017,
2018,
2019]
```

Definamos la función en Python y realicemos elprocedimiento de ajuste de curva utilizado para el crecimiento logístico.

In [123]:

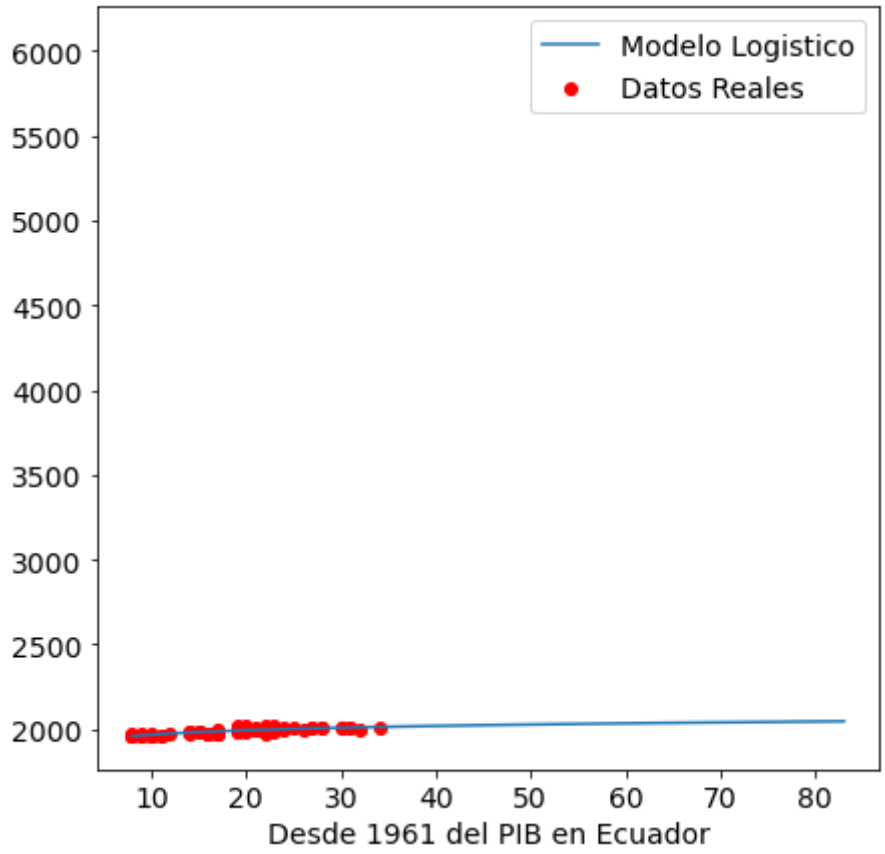
```
def modelo_logistico(x,a,b):
    return a+b*np.log(x)

exp_fit = curve_fit(modelo_logistico,x,y)
print(exp_fit)
```

```
(array([1882.39851097,   37.3091618 ]), array([[ 66.61474569, -22.82928999],
       [-22.82928999,   7.97891718]]))
```

In [124]:

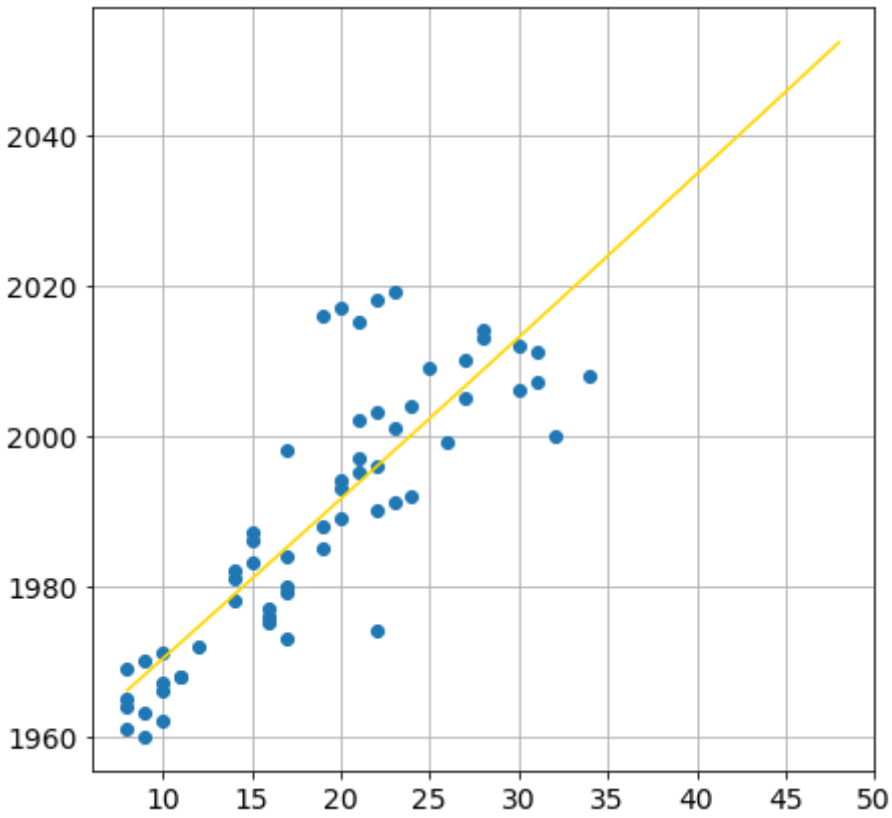
```
pred_x = list(range(min(x),max(x)+50)) # Predecir 50 dias mas
plt.rcParams['figure.figsize'] = [7, 7]
plt.rc('font', size=14)
# Real data
plt.scatter(x,y,label="Datos Reales",color="red")
# Predicted exponential curve
plt.plot(pred_x, [modelo_logistico(i,exp_fit[0][0],exp_fit[0][1]) for i in pred_x], lab
plt.legend()
plt.xlabel("Desde 1961 del PIB en Ecuador")
plt.ylabel("")
plt.ylim((min(y)*0.9,max(y)*3.1)) # Definir los limites de Y
plt.show()
```



In [125]:

```
curve_fit = np.polyfit(x, np.log(y), deg=1)
print(curve_fit)
pred_x = np.array(list(range(min(x), max(x)+15)))
yx = np.exp(curve_fit[1]) * np.exp(curve_fit[0]*pred_x)
plt.plot(x,y,"o")
plt.plot(pred_x,yx, color="gold")
plt.grid(True)
```

```
[1.07303055e-03 7.57519397e+00]
```



In [ ]:

```

```