Importing Necessary Libraries

In [4]:
```
import tensorflow as tf
import keras
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import cv2
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense,
import os
```

In [5]:
```
cur_dict = {0:10,1:20,2:50,3:100,4:200,5:500,6:2000}
```

Load Data Function

In [6]:
```
def load_data(working_dir):
    X = []
    Y = []

    for root, dirs, all_images in os.walk(working_dir):
        for image in all_images:
            img = cv2.imread(os.path.join(root, image))
            img = cv2.resize(img, (300, 300))
            img = img / 255
            X.append(img)
            Y.append(root.split('\\')[-1])

    X = np.array(X)
    Y = np.array(Y).astype(int)

    return X, Y
```

Taining Data

In [7]:
```
working_dir = "Currency_Classification_Project\\dataset\\training\\"
X, Y = load_data(working_dir)
```

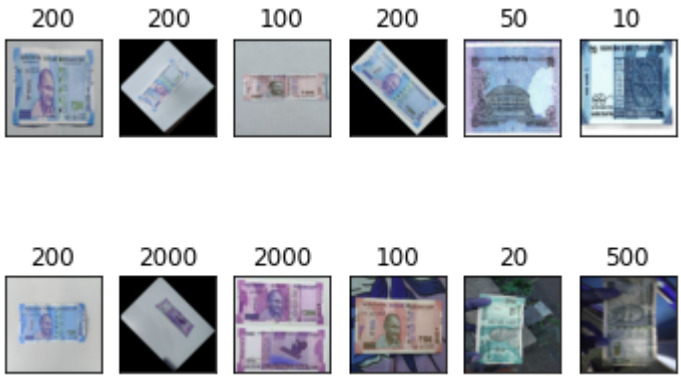
In [8]:

```
import random
sample_img = [random.randint(1,len(X)) for i in range(12)]
sample_img

fig, axes = plt.subplots(2, 6,figsize=(10, 7))

for i in range(12):
    axes[i // 6, i % 6].imshow(X[sample_img[i]])
    axes[i // 6, i % 6].set_title(f"{cur_dict[Y[sample_img[i]]]}")
    axes[i // 6, i % 6].get_xaxis().set_visible(False)
    axes[i // 6, i % 6].get_yaxis().set_visible(False)

```



Modelling

In [9]:

```
# Define the CNN model architecture.
model = Sequential()

# 1 CNN
model.add(Conv2D(32, (3, 3), activation='relu', input_shape=(300, 300, 3))
model.add(MaxPooling2D((2, 2)))

# 2CNN
model.add(Conv2D(64, (3, 3), activation='relu'))
model.add(MaxPooling2D((2, 2)))

# 3 Fully Connected Layers
model.add(Flatten())

model.add(Dense(128, activation='relu'))

model.add(Dense(64, activation='relu'))

# 4 Output Layer
model.add(Dense(7, activation='softmax'))

# Compile the model.
model.compile(loss="sparse_categorical_crossentropy",optimizer="adam",metr
```

In [34]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 298, 298, 32)      896

 max_pooling2d (MaxPooling2D  (None, 149, 149, 32)     0
 )

 conv2d_1 (Conv2D)           (None, 147, 147, 64)      18496

 max_pooling2d_1 (MaxPooling  (None, 73, 73, 64)       0
 2D)

 flatten (Flatten)           (None, 341056)            0

 dense (Dense)               (None, 128)               43655296

 dense_1 (Dense)             (None, 64)                8256

 dense_2 (Dense)             (None, 7)                 455

=================================================================
Total params: 43,683,399
Trainable params: 43,683,399
Non-trainable params: 0
_________________________________________________________________
```

In [11]:
```
# Train the model.
model.fit(X, Y, batch_size=32, epochs=3)
```

```
Epoch 1/3
397/397 [==============================] - 643s 2s/step - loss: 1.2211 - accu
racy: 0.6111
Epoch 2/3
397/397 [==============================] - 630s 2s/step - loss: 0.3890 - accu
racy: 0.8745
Epoch 3/3
397/397 [==============================] - 634s 2s/step - loss: 0.1480 - accu
racy: 0.9565
```

Out[11]:
```
<keras.callbacks.History at 0x275e4abed70>
```

In [26]:
```
YP = model.predict(X[[10000]])
```

```
1/1 [==============================] - 0s 42ms/step
```

In [27]:
```
YP.argmax()
```

Out[27]:
```
5
```

In [25]:
```
1 Y[10000]
```

Out[25]: 5

Dumping the model

In [31]:

```
import pickle

with open("currency_prediction_model_3", "wb") as f:
    pickle.dump(model, f)
```

```
Keras weights file (<HDF5 file "variables.h5" (mode r+)>) saving:
...layers\conv2d
......vars
.........0
.........1
...layers\conv2d_1
......vars
.........0
.........1
...layers\dense
......vars
.........0
.........1
...layers\dense_1
......vars
.........0
.........1
...layers\dense_2
......vars
.........0
.........1
...layers\flatten
......vars
...layers\max_pooling2d
......vars
...layers\max_pooling2d_1
......vars
...metrics\mean
......vars
.........0
.........1
...metrics\mean_metric_wrapper
......vars
.........0
.........1
...optimizer
......vars
.........0
.........1
.........10
.........11
.........12
.........13
.........14
.........15
.........16
.........17
.........18
.........19
.........2
.........20
.........3
.........4
.........5
.........6
.........7
.........8
```

```
.........9
...vars
Keras model archive saving:
File Name                                                 Modified             Si
ze
config.json                                          2023-05-25 20:37:14         35
14
metadata.json                                        2023-05-25 20:37:14
64
variables.h5                                         2023-05-25 20:37:14    5242363
92
```

In [32]:
```
1 import joblib
2 joblib.dump(model,"currency_prediction_model_3_joblib.pkl")
```

Dumping Inputs & Labels

In [35]:
```
1 X.shape
```

Out[35]:
```
(12699, 300, 300, 3)
```

In [42]:
```
1 joblib.dump(X,"Input_X.pkl")
```

Out[42]:
```
['Input_X.pkl']
```

In [41]:
```
1 joblib.dump(Y,"Labels_Y.pkl")
```

Out[41]:
```
['Labels_Y.pkl']
```

In [45]:
```
1 print(type(X))
2 print(type(Y))
```

```
<class 'numpy.ndarray'>
<class 'numpy.ndarray'>
```