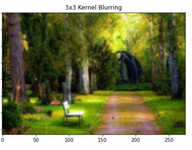
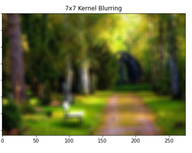
In [1]:
```
# Our Setup, Import Libaries, Create our Imshow Function and Download our Images
import cv2
import numpy as np
from matplotlib import pyplot as plt

# Define our imshow function
def imshow(title = "Image", image = None, size = 10):
    w, h = image.shape[0], image.shape[1]
    aspect_ratio = w/h
    plt.figure(figsize=(size * aspect_ratio,size))
    plt.imshow(cv2.cvtColor(image, cv2.COLOR_BGR2RGB))
    plt.title(title)
    plt.show()
```

In [2]:
```
import cv2
import numpy as np

image = cv2.imread('download.jpg')
imshow('Original Image', image)

# Creating our 3 x 3 kernel
kernel_3x3 = np.ones((3, 3), np.float32) / 9

# We use the cv2.fitler2D to conovlve the kernal with an image
blurred = cv2.filter2D(image, -1, kernel_3x3)
imshow('3x3 Kernel Blurring', blurred)

# Creating our 7 x 7 kernel
kernel_7x7 = np.ones((7, 7), np.float32) / 49

blurred2 = cv2.filter2D(image, -1, kernel_7x7)
imshow('7x7 Kernel Blurring', blurred2)
```

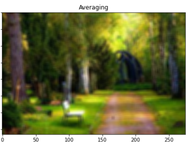


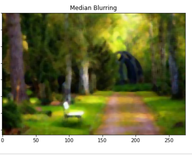


Other commonly used blurring methods in OpenCV

Regular Blurring Gaussian Blurring Median Blurring

In [3]:
```
import cv2
import numpy as np

image = cv2.imread('download.jpg')

# Averaging done by convolving the image with a normalized box filter.
# This takes the pixels under the box and replaces the central element
# Box size needs to odd and positive
blur = cv2.blur(image, (5,5))
imshow('Averaging', blur)

# Instead of box filter, gaussian kernel
Gaussian = cv2.GaussianBlur(image, (5,5), 0)
imshow('Gaussian Blurring', Gaussian)

# Takes median of all the pixels under kernel area and central
# element is replaced with this median value
median = cv2.medianBlur(image, 5)
imshow('Median Blurring', median)
```





In [4]:
```
# Bilateral is very effective in noise removal while keeping edges sharp
bilateral = cv2.bilateralFilter(image, 9, 75, 75)
imshow('Bilateral Blurring', bilateral)
```

In [5]:
```
image = cv2.imread('download.jpg')
imshow('Original', image)

dst = cv2.fastNlMeansDenoisingColored(image, None, 6, 6, 7, 21)
imshow('fastNlMeansDenoisingColored', dst)
```

In [6]:
```
# Loading our image
image = cv2.imread('download.jpg')
imshow('Original', image)

# Create our shapening kernel, remember it must sum to one
kernel_sharpening = np.array([[-1,-1,-1],
                              [-1, 9,-1],
                              [-1,-1,-1]])

# applying the sharpening kernel to the image
sharpened = cv2.filter2D(image, -1, kernel_sharpening)
imshow('Sharpened Image', sharpened)
```

In [ ]: