# Introduction

The VisionCoin application outlined below is designed to provide a solution for the detection and recognition of US coins, followed by the calculation of the total dollar value of the recognized coins. This report outlines the methodology, results, and conclusions related to the development of the VisionCoin application.

# Methodology

## Detect Presence of Coins

This application accepts images captured using a mobile phone camera as input. These images are then processed to detect the presence of coins. The following operations are applied to each input image: conversion to grayscale and Gaussian blur to reduce noise. The Hough Circle Transform algorithm is then utilized to identify circular shapes within the binary image.

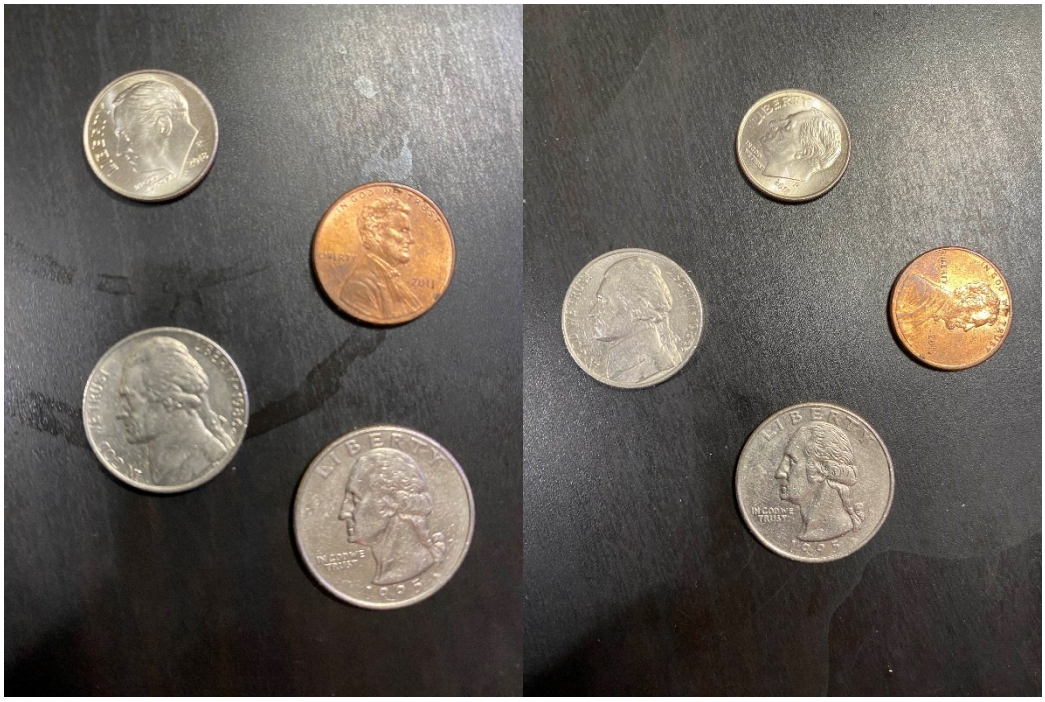

Image 1: Input images captured using phone camera

## Recognize Individual Coins

For coin recognition, the application employs SIFT (Scale-Invariant Feature Transform) and FLANN (Fast Library for Approximate Nearest Neighbors) algorithms. The recognition process involves the following steps:

**Feature Extraction:** SIFT is used to extract scale-invariant key features from both the input image and reference coin images.

**Feature Matching:** FLANN is employed to match the extracted features from the input image with those from the reference coin images. The matching process identifies the best-matching coins based on the similarity of feature vectors.

**Classification:** The classification mechanism is based on the ratio of good matches. For each recognized coin, the ratio of good matches with each reference coin image is calculated. The coin type is determined by selecting the reference coin image with the highest matching ratio.

## Calculate Total Dollar Value

The application has a mapping of recognized coins to their respective values, allowing for the calculation of the total dollar value based on recognized coin counts and values.

## Results

The VisionCoin application was tested with two different input images, each with varying coin configurations. In the first test image, the application correctly classified 3 out of the 4 detected coins. This demonstrates a high level of accuracy in coin recognition. In the second test image, the application classified 2 out of 4 detected coins correctly. While this result indicates slightly lower accuracy, it is important to consider that the performance may vary based on the complexity of the arrangement and the quality of the input image.


Image 2: Results after coin detection and recognition

## Conclusion

The VisionCoin application, utilizing Hough Circle detection and feature-based matching with SIFT and FLANN for coin recognition, has shown promising results. It demonstrated high accuracy in classifying coins in the first test image and reasonably accurate results in the second test image. Further improvements can be explored to enhance robustness under different conditions and coin arrangements including the use of different detection and recognition algorithms.