Buck Tracker: System For Multi Banknotes Tracking

ID[127]

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Introduction 1/2

- ➔ According to FBI, In 2021, around $4 billion is lost to theft each year in the US alone.
- ➔ The Bank of England reported that over 4.7 billion England notes worth approximately £82 billion were in circulation annually in 2017.
- ➔ Approximately $300 billion is laundered through the United States each year.

- Kuadli, J. (2023, May 20). *15 insane identity theft statistics to keep in mind in 2023*. Find Best Law Jobs in the US in 2023. https://legaljobs.io/blog/identity-theft-statistics/
- Howarth, J. (2023, January 19). *30+ identity theft statistics for 2023*. Exploding Topics. https://explodingtopics.com/blog/identity-theft-stats
- *20 money laundering statistics [2023] facts about money laundering in the U.S.* Zippia. (2023, May 12). https://www.zippia.com/advice/money-laundering-statistics/

Introduction 2/2

➔ Creating a software that allows users to track their money transactions on a daily basis.

Challenges

Bad Lighting Conditions

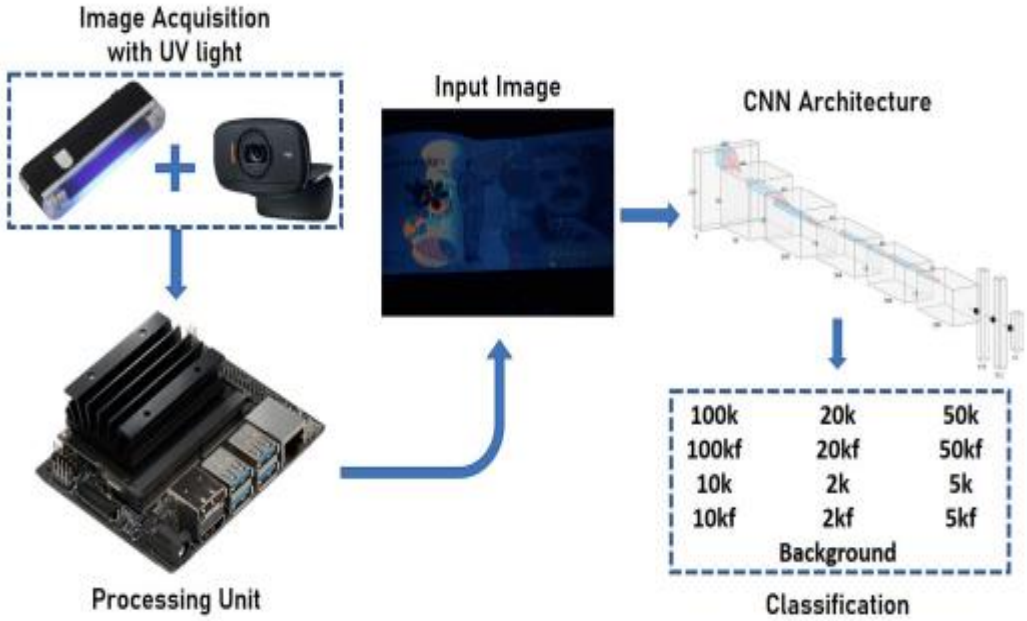
Good Lighting Conditions

Lighting Conditions

variations in text color, font, size, and language

Related Work 1/2

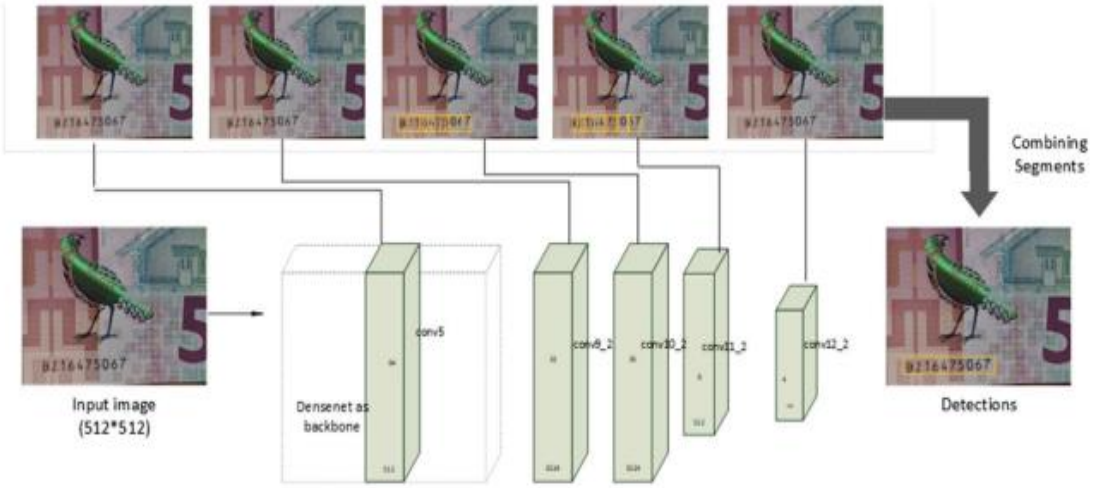
- ➔ Fake Banknote Recognition Using Deep Learning.
- ➔ Created custom CNN model to detect counterfeit notes.
- ➔ The model achieved 100% accuracy.
- ➔ Dataset consisted of 7280 images of Colombian peso.
- ➔ Limitation was that the custom model need a sufficiently diverse dataset to avoid overfitting.



Pachón, C. G., Ballesteros, D. M., & Renza, D. **(2021b)**. Fake banknote recognition using Deep Learning. *Applied Sciences*, *11*(3), 1281. https://doi.org/10.3390/app11031281

Related Work 2/2

- ➔ recognize serial numbers on banknotes using deep learning.
- ➔ CRNN network is established for the recognition of banknote serial numbers.
- ➔ The detection was 95.80%.
- ➔ dataset in this experiment contains 1000 original samples, which were expanded to 5000 after data augmentation.
- ➔ Limitations are dataset-specific, and results may vary in different datasets or real-world scenarios.



Ma, X., Yan, W.Q. Banknote serial number recognition using deep learning. *Multimed Tools Appl* **80**, 18445–18459 **(2021)**. https://doi.org/10.1007/s11042-020-10461-z

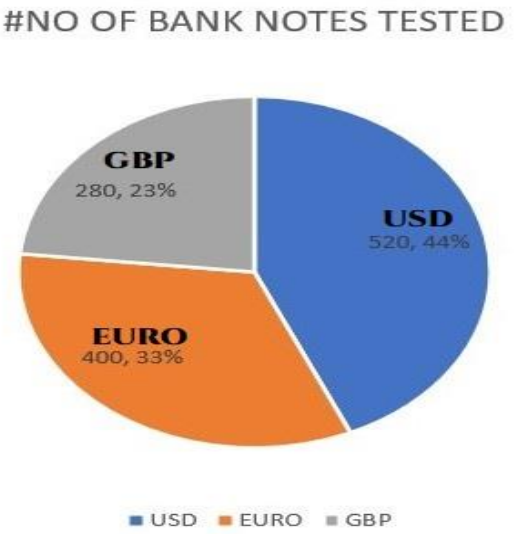
Problem Statement

To improve accuracy, BuckTracker requires precise localization of serial numbers, accurate detection of currency denominations, and effective recording of scan locations, overcoming various challenges in the process.

Dataset 1/2

The dataset consisted of 160 images.

Split between 3 classes (GBP, USD, Euro).



Dataset 2/2


ONE HUNDRED DOLLARS


FIVE
DOLLARS


10
EURO


20
EURO


100
EURO


£5
Five Pounds

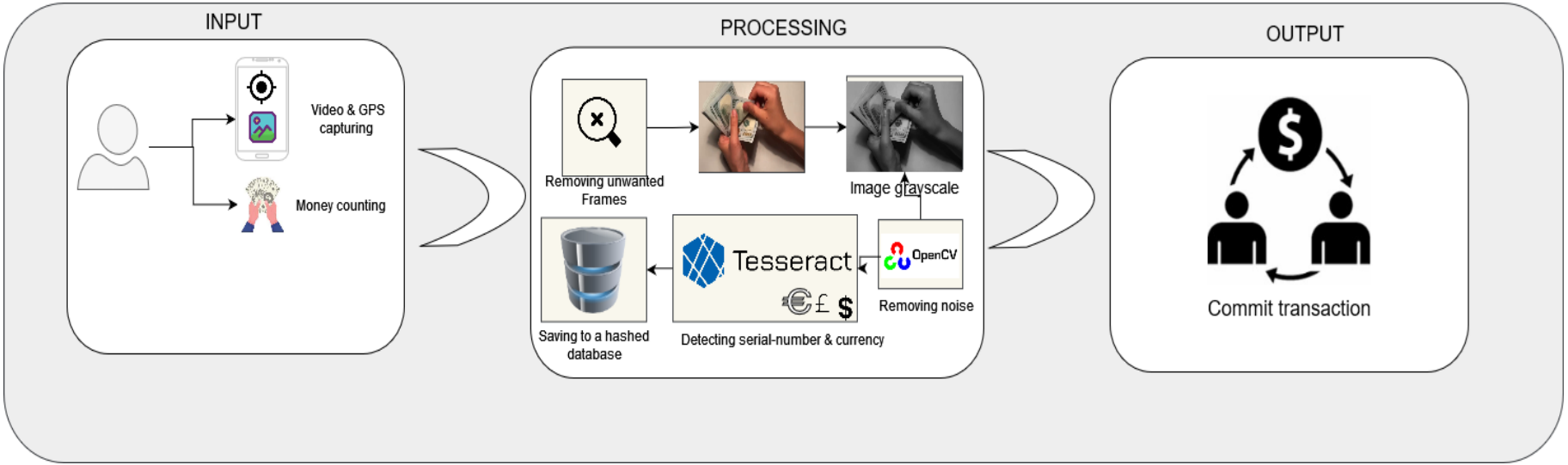

50
FIFTY
DOLLARS


5
EURO


THE UNITED STATES OF AMERICA
ONE DOLLAR


SPECIMEN

System Architecture



Input

Video of counting money

Image of banknote

Image Enhancement

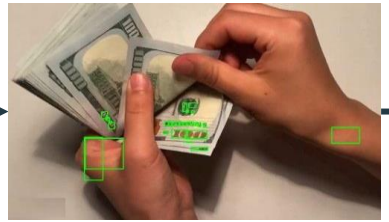
Original Frame

Grayscale filter

Median Blur filter

Processing

Tesseract OCR



Applying the first layer of segmentation

Applying the second layer of segmentation

Objective, and Set-Up

Detecting and localizing serial numbers of the banknotes in Real time.

Measuring serial number detection accuracy.

Experiment 1/2

Tesseract
Image to boxes

Serial Number
recognition

Experiment 2/2

Tesseract
Image to string

(REGEX) Filtering

Serial number
recognition

Result1/2

	Currencies	Time	Average Accuracy
Experiment 1	3	12.29 s	92.3%
Experiment 2	3	15.85 s	92%

Result2/2


Currency = USD


Currency is : Euro
100
EURO


Currency is : GBP
Bank of England
£5
Five Pounds
I have nothing to offer but blood, toil, tears and sweat
AL22 890638

Thank you!
Any Questions ?

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Khaled Mosallam

Conclusions

- In conclusion, the persisting issue of cash security in many countries calls for an easy and feasible solution.
- The experiment aims to address this issue by using optical character recognition (OCR) to track banknotes.
- The proposed BuckTracker system offers a secure money tracking and transaction process.
- The system quickly identifies a banknote's serial number region, determines its location and category.
- Users should stabilize their phones in a vertical position with a clear view of the serial number for accurate counting.
- Standardized testing showed higher accuracy with banknotes that had less noise.
- Euro banknotes posed a challenge to the system due to multiple unwanted image patterns misleading the OCR algorithm.
- The system achieved an overall average accuracy of 92.3%.

Future Work

-challenges may persist in identifying serial numbers with symbols, such as mistaking '*' for '+', requiring further development and improvement.

-Additional pre-processing techniques should be explored to remove unwanted frames where the serial number is not fully visible, optimizing the system's performance.

-Currently, the experiments assumed correctly registered images without the need for rotation or cropping. Future improvements should address these registration issues.

-In the near future, a well-structured API should be developed to ensure the availability and reliability of the BuckTracker system as a service.


RESERVE NOTE
THE UNITED STATES OF AMERICA
PH 30893229 A
20
TWENTY DOLLARS


£5
AE45 729269