Iris Spoofing

Muhammad and Yvette

Problem

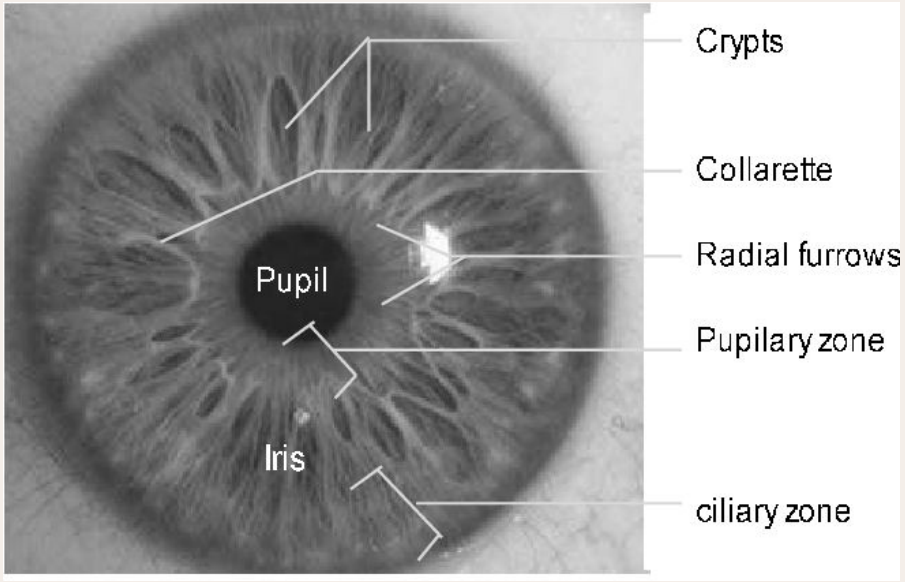
- **Inspired from fingerprint spoofing**
  - Acquiring someone's fingerprint, creating a mold to access a system
- **Possibility to replicate someone else's iris using simple means to access a system**

Hypothesis

- **Muhammad's Hypothesis**
  - Replication is possible using translucent mediums but not with transparent mediums.
  -
- **Yvette's Hypothesis**
  - I believe the iris scanner will be able to match the iris with the translucent paper over the iris. I especially believe it should be able identifiable features that are easy detectable.

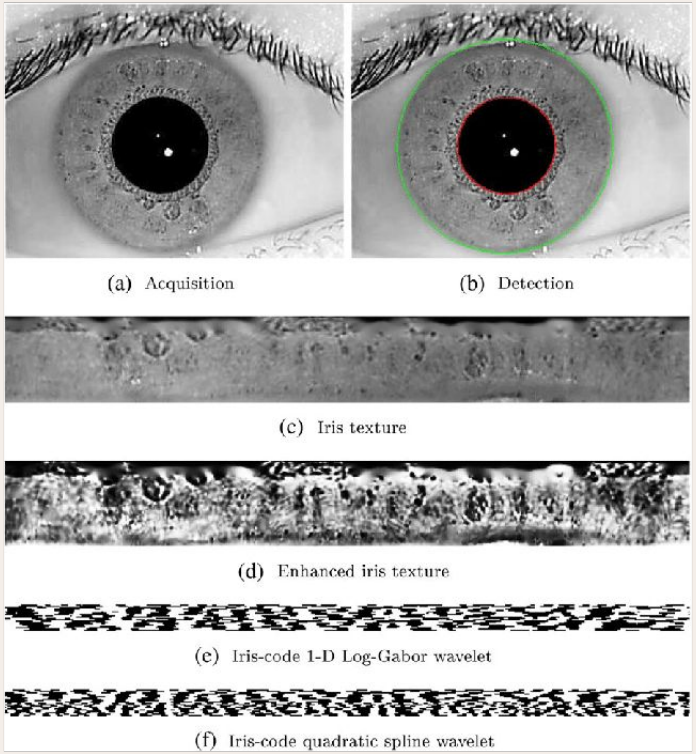
Iris Recap: What is it?

- **“Iris”, refers to the unique pattern within the iris of the eye.**
- **Iris Patterns Include**
  - Ridges, furrows, and crypts
    - These remain permanent and unchangeable
  - Collarette
  - Scleral Limbus
    - Boundary between iris and sclera
- **Iris Patterns are epigenetic**
  - Environment shapes iris
  - Both eyes have different Patterns



Iris Recap: Iris Code

- **Extracting Iris Code loosely follows:**
  - Acquiring Iris via IR
  - Enhancement
    - Segmentation
    - Localize Boundaries
    - Remove Artifacts like eyelash, eyelids and reflections
    - Normalization
  - Feature Extraction:
    - Apply 2D Gabor Filters
    - Obtain Binarized iris code
    - Optional: Binarized Statistical Image Features
      - Applying different filters to obtain various projections



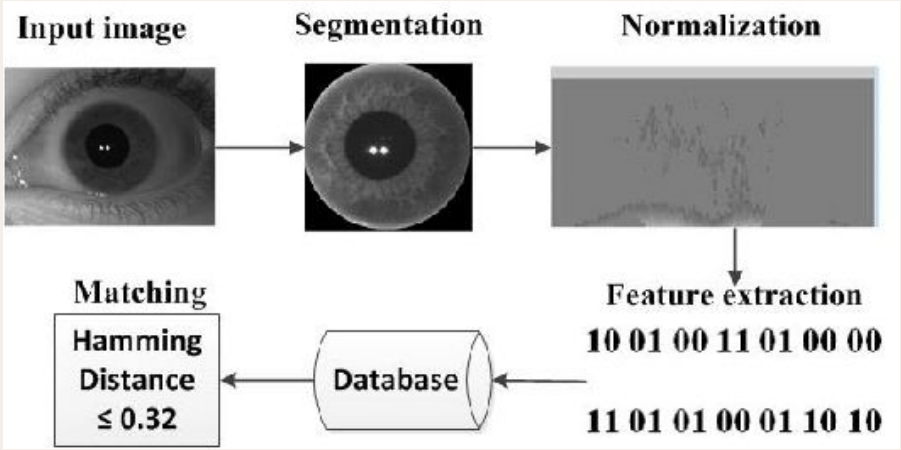
Iris Recap: Matching Methods

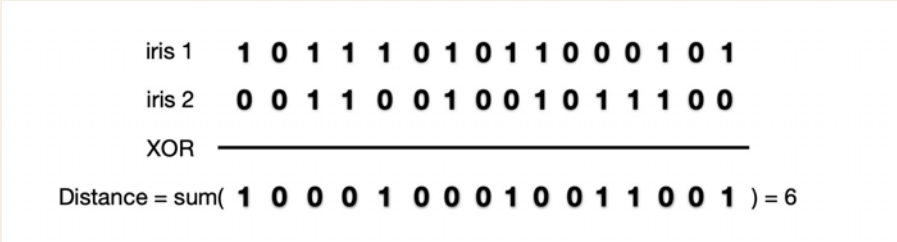
Hamming Distance

- A measure used to calculate the distance between two iris codes
- Hamming distance is computed by comparing the bits in the code

Domain-Specific Codes

- Enhance the performance within a particular domain
- Considers specific characteristics of iris patterns (Crypts, furrows, etc)





Methodology

Overview of our Study

- **Experiments**
  - We utilized the iris scanner, which was also used in class to store our iris template to a computer
  - We first added our irises to our database
    - We scanned each iris twice, once normally then upside down
  - We then printed out each iris on a sheet of printer paper at the highest resolution
  - We then scanned the printed irises with the scanner and tested if the system would be able to identify our printed irises.
  - After we ensured the system was able to recognize us based on that

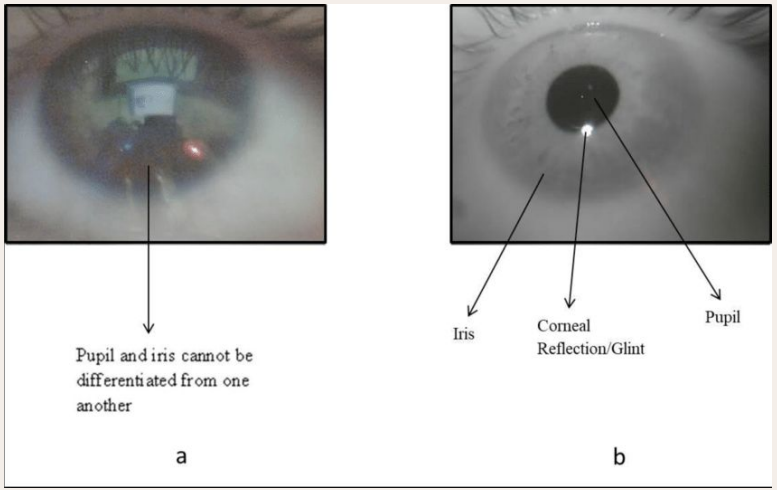
Experiments

- **Once we had our dataset complete we could test whether or not we were able match the iris on the translucent paper.**
- **Steps**
  - Start with singular iris example Muhammad's left eye
  - Overlay Muhammad's left eye, which is on the translucent paper onto Yvette's left eye, which is on the solid white paper
  - Attain Infrared Iris scanner to capture and detect Muhammads Iris against the backdrop of Yvette's eye
  - After the iris has been attained, run a matching method to check to see if the iris exists within the database.
- **We continued this process to each pair of irises, including placing the iris over its matching pair**
- **Problems**
  - One issue we ran into was ensuring the translucent iris was placed at the right orientation to properly overlap irises

Results

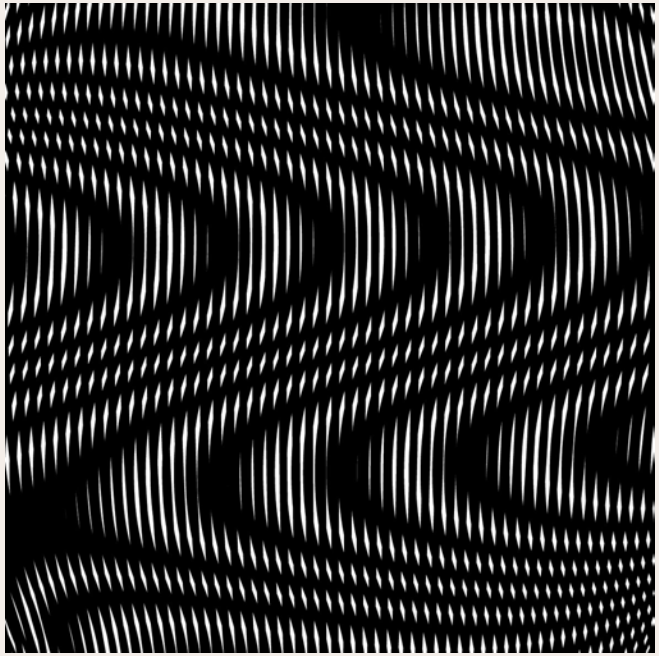
- **Overall results were very not very relieving**
  - It is possible to replicate someone's iris pattern using conventional means (Printers) and have them identified as that individual
  - It will not work for transparent paper however due to limitations in printing precise patterns but question still remains if just the pattern on the contact will allow you to identify as someone else
- **Underlying color on translucent does not affect iris recognition**

- **Overlaying the translucent paper over another iris also does work when you try to match the iris.**



Next Steps

- **One thing we can further test is perhaps adding more irises' into the database '**
- **Printing the iris on a contact lense and inserting into a real eye.**
  - How to print iris pattern on contact?
  - Prescriptions to acquire contacts
- **We could also test the matching process with a larger dataset**
- **Attain a printer that could print in a higher resolution to ensure that patterns within the iris are easily recognized by the scanner**
- **Account for pattern interference and IR reflection when scanning**



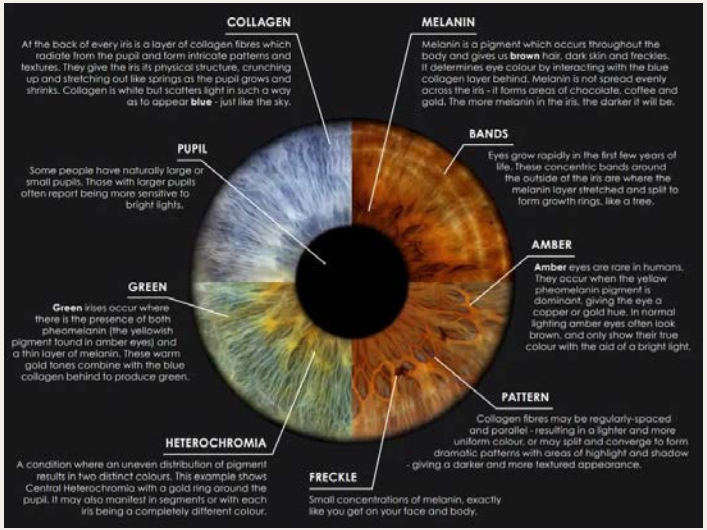
Ex: Moire Patterns with printed Iris

Conclusion

- **Our overall goal was to prove whether or not it is possible to spoof an iris detector utilizing a printed eye**

- **Our results concluded that it is possible to spoof the Iris detector using translucent mediums and placing it over the iris using a home printer.**

- **This does not work for transparent mediums**
  - Produces too much pattern interference when overlaid
  - Reflects the IR light back at sensor
- **Limitations can be overcome using contact lenses**
- **New Project Idea: Can we create a master iris pattern?**



Thank You!

Any Questions?