Smart Mirror RORRIM

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DEAN'S CHOICE AWARD

Background & Project Goal

Many health monitoring devices are single-purpose and inconvenient for daily use (e.g. thermometers). Repurposing the household mirror, RORRIM encourages users to proactively monitor their health by displaying health information in plain view and giving health recommendations.

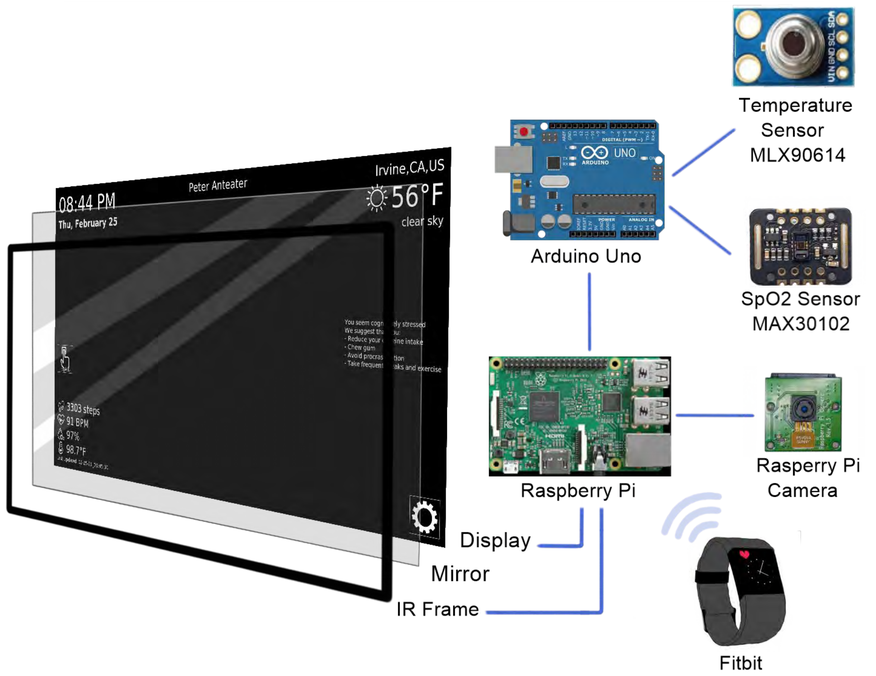
RORRIM incorporates non-invasive devices to help end-users monitor:

- Heart rate
- Step count
- Blood Oxygen Saturation Level (SpO2)
- Temperature
- Stress Stage

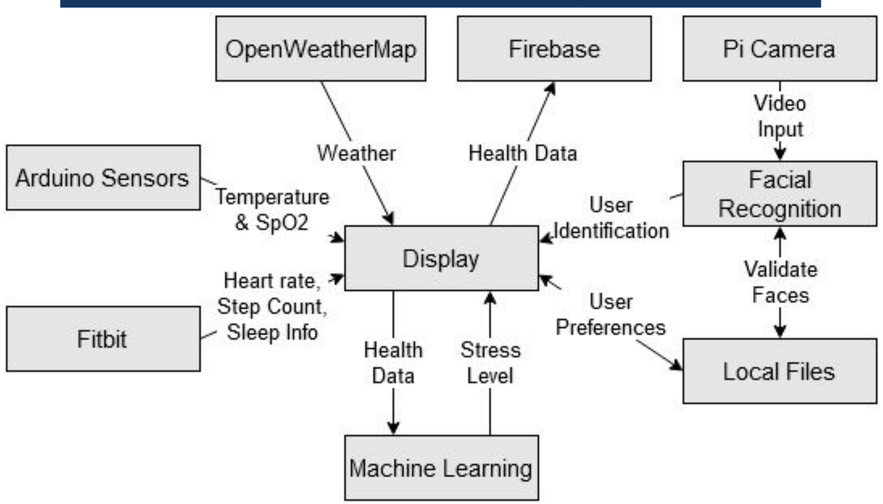
Implementation

- Personalized Tkinter GUI
- Histogram of oriented gradients (HOG) and convolutional neural network (CNN) face recognition algorithms
- k-number of neighbors (kNN) sklearn algorithm for machine learning
- Asynchronous architecture pulls sensor data and updates Firebase database

Hardware Components



Software Design



Results

RORRIM achieves health monitoring by:

- Featuring an interactive GUI including touch input, datetime, weather, and health information
- Identifying users through facial recognition
- Managing user data through Firebase Server
- Using health data with kNN machine learning classifier to infer stress stage at over 91% accuracy, giving appropriate recommendations

Improvements

- Implement encryption
- Achieve a higher accuracy for stress stage prediction using deep neural networks
- Support additional wearable devices
- Finalize mirror frame exterior

References

[1] S. Colantonio *et al.*, "A smart mirror to promote a healthy lifestyle," *Biosystems Engineering*, vol. 138, pp. 33–43, Oct. 2015, doi: 10.1016/j.biosystemseng.2015.06.008.

[2] M. Bansal, "Face Recognition Implementation on Raspberrypi Using Opencv and Python," Social Science Research Network, Rochester, NY, SSRN Scholarly Paper ID 3557027, 2019. Accessed: Oct. 21, 2020. [Online]. Available: https://papers.ssrn.com/abstract=3557027.

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