HailRick
A tool to help the visually impaired in India hail auto-rickshaws

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Motivation

Hailing auto-rickshaws is a major obstacle [1] for the visually impaired in India, because the steps typically involve sighted assistance. A study identified perpetual dependence on sighted assistance for external travel a leading cause of frustration for a large number of visually impaired people [2]. This project aims to use Computer Vision to eliminate the need for sighted assistance in hailing auto-rickshaws, by building a tool that uses the smartphone camera to alert the visually impaired user when an auto-rickshaw is passing by.

Data

•Training:
990 images of auto rickshaws downloaded via Google Images.
980 images of empty roads, cars, bikes and buses downloaded via Google Images.
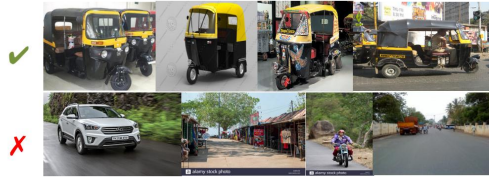
•Dev:
150 screenshots of auto-rickshaws on the road, taken from 20 YouTube videos of busy Indian roads.
150 screenshots of empty roads, bikes and buses taken from the same videos.

•Test:
Similar to Dev.

Models and Results

Model	Train accuracy	Dev accuracy	Test accuracy
Logistic Regression	76%	69%	67%
Feed-forward Neural Network	93%	89%	87%
Convolutional Neural Network	98%	96%	95%

Error Analysis

The CNN model performs the best, but has a problem in identifying auto-rickshaws in the dev set in a few cases:
• When the auto-rickshaw is not of the typical color (yellow-green-black).
• When lighting is poor (dark).
• When some other vehicle is of the typical auto-rickshaw color.

Discussion

• Feasibility study suggests that hailing auto-rickshaws is a problem faced by millions of visually impaired people daily, due to the need for manual assistance.
• The model results suggest that this is a viable application of CNNs to the problem.

Hurdles

• Building an app that fits and works fast on a typical Indian smartphone: The need to implement SqueezeNet [3].
• Images are not as rich as videos (temporal data and sounds): Analyze real-time videos instead of periodic snapshot images.
• Detecting *empty* auto-rickshaws.

References

1. https://trid.trb.org/view/890862 "Barriers to Accessible Transportation and Access in Urban India: A Case Study of Kolkata"
2. https://escholarship.org/uc/item/5pv2k256 "Attitudes of Visually Impaired Persons Toward the Use of Public Transportation"
3. https://arxiv.org/abs/1602.07360 "SqueezeNet: AlexNet-level accuracy with 50x fewer parameters and <0.5MB model size"