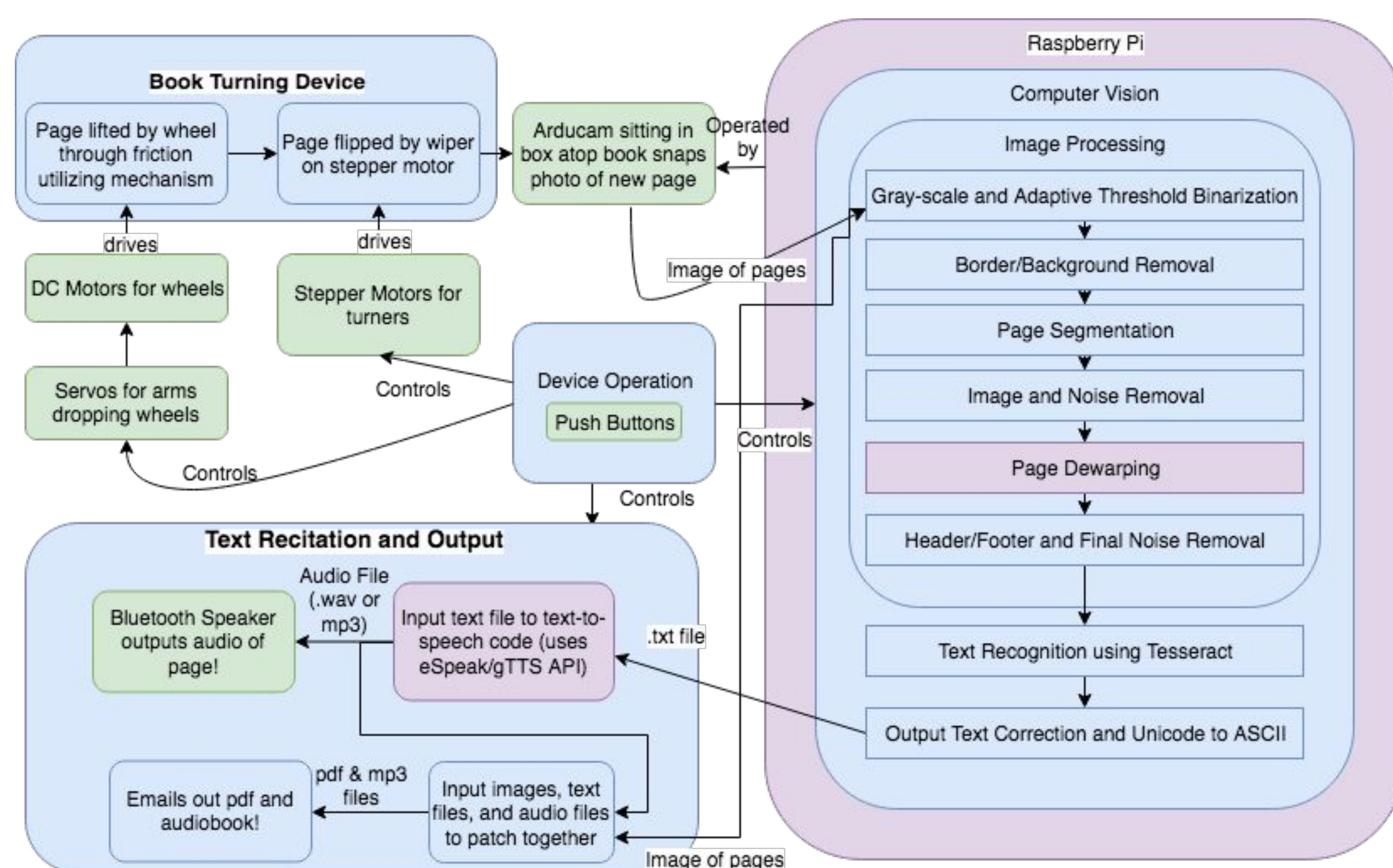


## Overview

aesop is an assistive hands-free reading device that can be used in a variety of situations: whether by a child who cannot read yet, a multitasking student whose hands are busy with other things, or the visually impaired. It incorporates mechatronics, hardware, image processing, and computer vision in order to turn the pages of and read aloud the book you would like to hear.

## System Architecture



## Approach

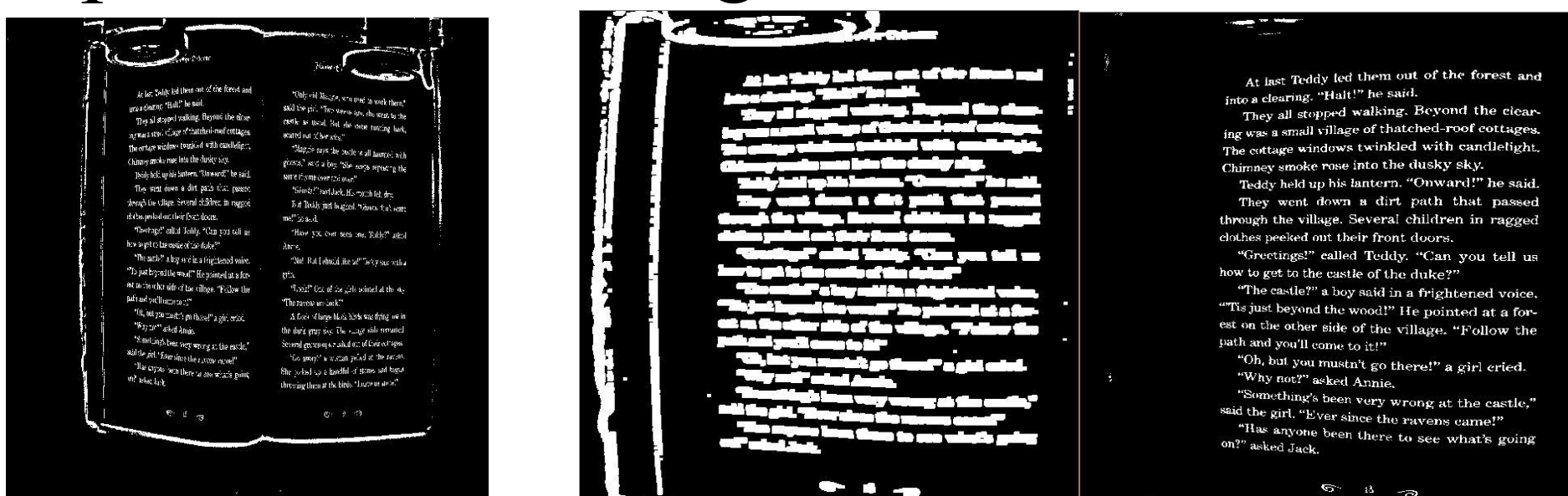
- Page separation and flipping
  - Wheels use friction to lift page up
  - Windshield wiper mechanism to flip page over
- Image processing and page dewarping in OpenCV
- Optical Text Recognition using Tesseract
- Google Text-to-Speech (gTTS) produces audio of text
- Control operation with different colored buttons
  - Flip page Forward, Backward, Run OCR and Text-to-Speech, Run Continuously, and Email Audiobook/PDF

## Specifications

- (1) Page turning device should flip one page at a time and have page lay flat for camera to take good picture
- (2) Camera needs to be at a reasonable height from book to take picture of entire page set, allowing for some variety of book sizes
- (3) Read only the body of the text
- (4) Accurately segment the book page from the background
- (5) Text will be processed with >75% accuracy - users should be able to understand text audio output.
- (6) Minimal delay in the reading of subsequent pages.

## Image Processing

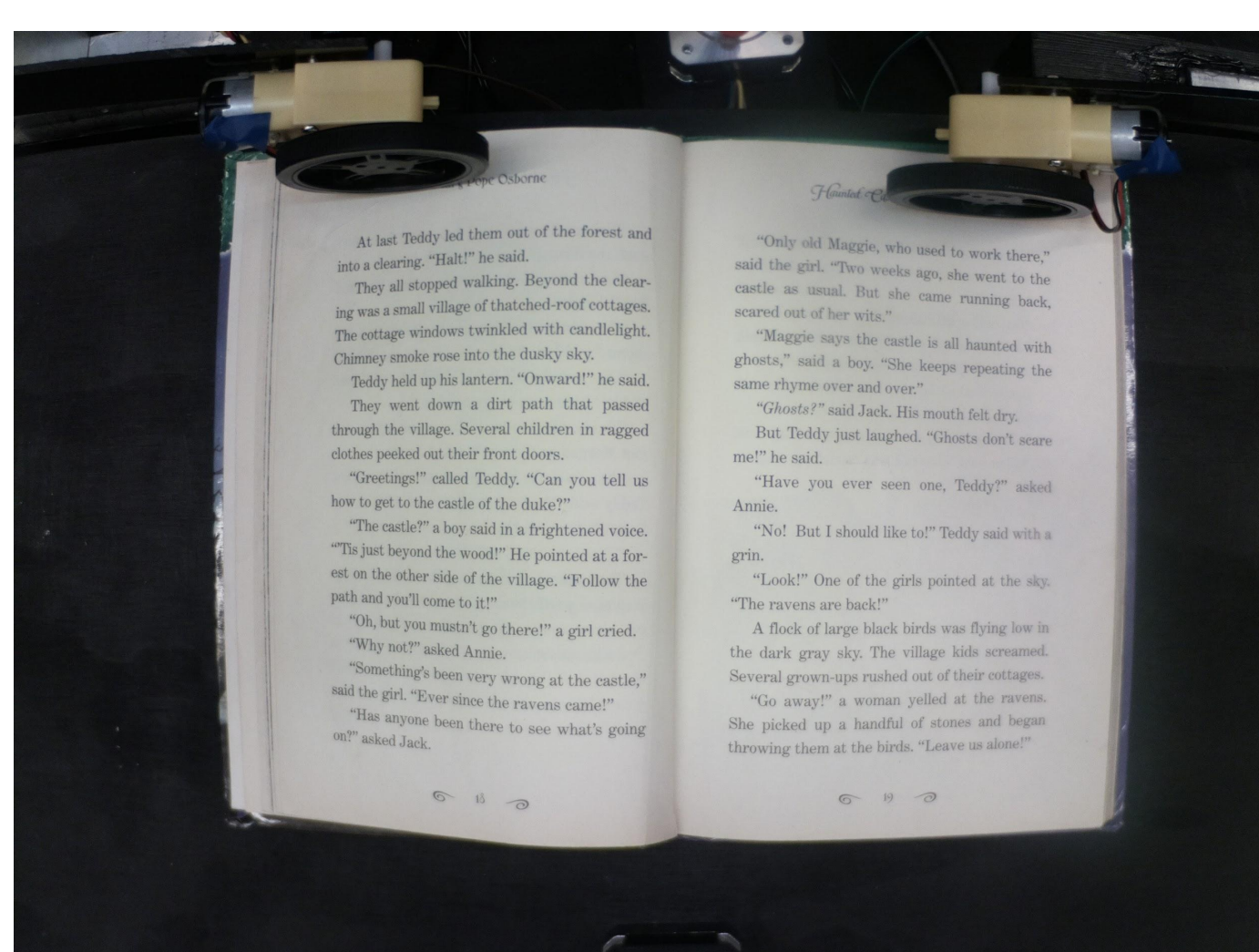
### Adaptive Thresholding and Noise/Blob Removal



### Page Dewarp and Final Noise/Blob Removal

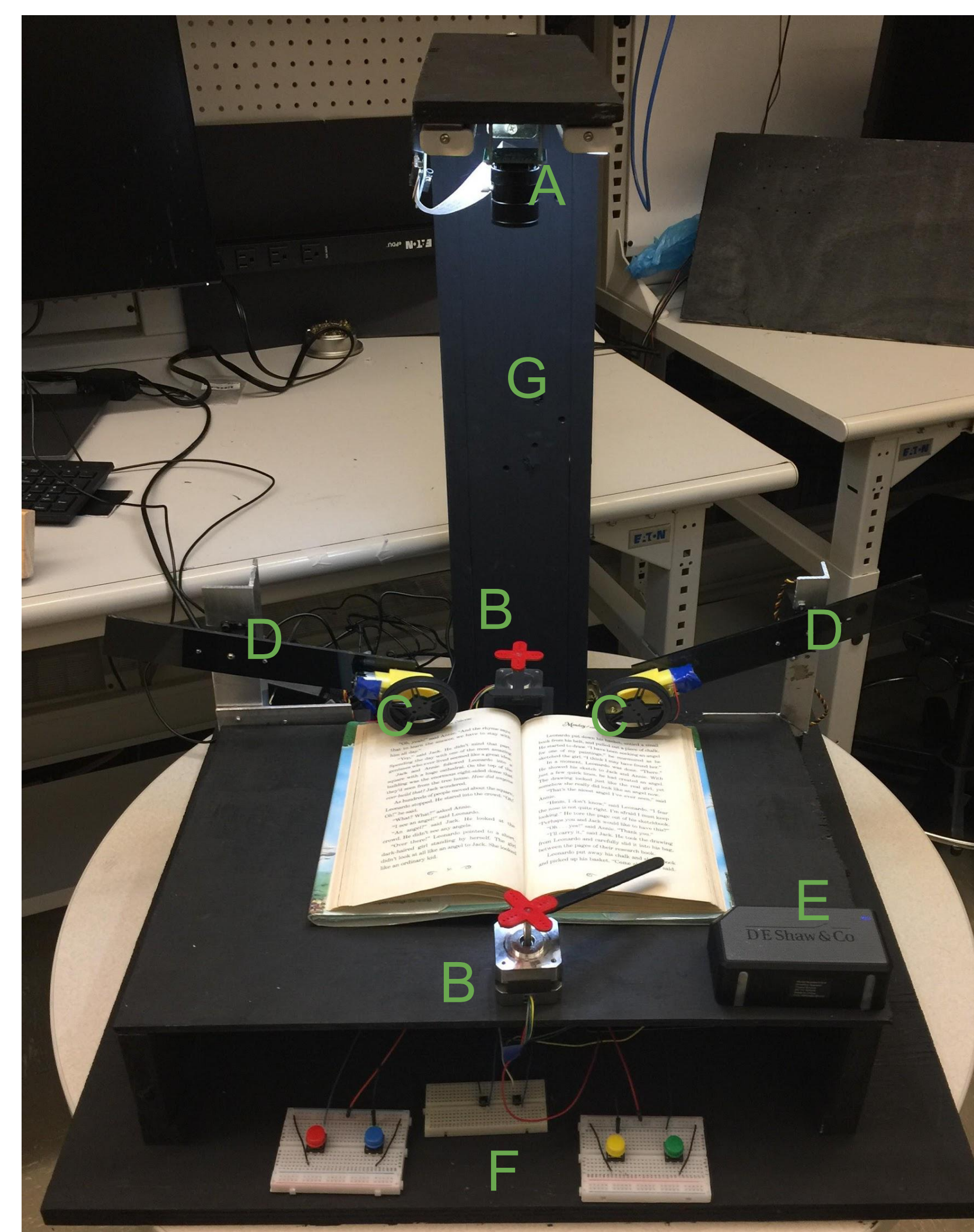


### Original Image and Text Output



At last 'feiddy led them out of the forest and into a clearing. Halt! he said. They all stopped walking. Beyond the clearing was a small village of thatched-roof cottages. The cottage windows twinkled with candlelight. Chinney smokes rose into the dusky sky. Teddy held up his lantern. Onward at he said. They went down a dirt path that passed through the village. Several children in ragged clothes peeked out their front doors. Greetings! called Teddy. Can you tell us how to get to the castle of the duke? The castle? a boy said in a frightened voice. Iris just beyond the wood! He pointed at a forest on the other side of the village. Follow the path and you come to it! Oh, but you mustn't go there! a girl cried. Why not? asked Annie. something's been very wrong at the castle, said the girl. Ever since the ravens came! Has anyone been there to see what's going on? asked Jacket Only um Maggie, who used to work there, said the girl. No weeks ago, she went to the castle as usual. But she came running back, scared out of her wits. Maggie says the castle is all haunted with ghosts, said a boy. She keeps repeating the same rhyme over and over. Ghosts? said Jacks. His mouth felt dry. But Teddy just laughed. Ghosts don't scare me! he said. Have you ever seen one, Teddy? asked Annie. Not! But I should like to! Teddy said with a grin. Look! One of the girls pointed at the sky. The ravens are back! A flock of large black birds was flying low in the dark gray sky. The village kids screamed. Several grownups rushed out of their cottages. Go away! a woman yelled at the ravens. She picked up a handful of stones and began throwing them at the birds. Leave us alone!

## System Setup



- A: Camera and lights
  - B: Windshield Wiper Page flipping motors
  - C: Wheels that lift pages
  - D: Servos that lift wheels
  - E: Speaker
  - F: Buttons
  - G: Collapsible Camera stand
- (Left to Right: Stop, Run single OCR & Text-to-Speech, Email Audiobook/Pdf, Run continuous mode, Flip Backward, and Forward)

## Additional Information



Special thanks to the Professors and Teaching Assistants of 18-500!