Video to Audio Substitution

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***Abstract*— The video to audio substitution software converts images from video frames to audio, using Matlab. Our software is different from other video to audio substitution software in that it only detects moving objects, which we believe poses the greatest thread to the visually impaired. Video, captured by a camcorder, is first processed by a motion detection algorithm, then the moving objects found in the motion detection algorithm are converted to soundIntroduction**

There are 39 million people worldwide who are blind. We are designing our device to help these people become aware of the moving objects around them. We are taking moving objects from video and converting it into sound. Moving objects are detected using a motion detection algorithm that involves frame subtraction. The Matlab program will allow the sound to travel between stereo speakers depending on where the object is. The program will also adjust frequency so that the pitch is also different depending on where the object is located. We plan on testing this simulation out thoroughly by doing random testing. If successful, this simulation can be the forefront to a great device in the future that can potentially make life easier for those who are visually impaired.

I. METHODS

Frame Subtraction and Filtering

The algorithm written in matlab takes each subsequent frame and subtracts from the previous one. This allows the program to capture the image of the moving object only. After frame subtraction, the image is filtered so that minimal movement, like leaves on a tree, is ignored and the object posing the greatest threat is left.

Figure: Top image shows original video, bottom image shows image after frame subtraction and filtering

Audio Projection

Matlab is used to create a 3-D-like sound that the user can interpret to determine where the moving object is located, the direction it is moving in, and the relative size of the object. This technique works by first finding the centroid of the moving object and tracking it through its progressions. The centroid is used to determine the location and direction of movement. The sound, played through the user's headphones, limits the amount of sound in the left or right speaker, depending on the location of the object. If the object is moving on the right side of the subject, the subject will hear more sound in their right ear than in the left, depending on how far to the right the object is from the subject's peripheral center. The same is true for the other side. When the object is in the middle, the sounds play at equal strength in both the right and left speakers. Depending on location of the object, the volume decreases by in increments of 10% until the volume reaches zero. At zero volume in the left speaker, the object is far to the right side of the subject. The same is true vice versa to the other side.

II. DISCUSSIOIN

Our visual to audio substitution method, involving motion detection and audio implementation algorithms, has shown promising results through our study, but has some limitations. One limitation of the current model involves camera movement, where objects become much harder to detect with more movement. An other limitation to our current model has to do with the amount of moving objects. Our motion detection algorithm only works with one moving object.

One of our future goals is to add more parameters to our motion detection algorithm for the detection of multiple objects. We also hope that our idea could be implemented into a portable device that could be used in the real world to help those with visual impairments.

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