TITLE :	Gesture Driven Smart Home Solution for Bedridden People	YEAR
		2020

KEY CONTRIBUTION	THEORY
A visual-based gesture-driven smart home system; MobiGo is proposed. New gesture-driven solution for the immobile people is implemented	to implement an effective solution; MobiGo in aid of immobile people in their domestic life. The target user is the bedridden patient and the gestures are capturing through the camera

DEPENDENT VARIABLES

- Convolutional Neural Network (CNN) is used as the image classifier
- The efficiency of the proposed system is based on the collected dataset
- The dataset contains various hand orientations and depths to give more variance to the dataset as the location of the bedridden patient can vary from one patient to another
- the hand orientation is also taken into consideration as the bedridden patient might not be able to pose the gesture as a stood-up person
- The CNN model training was done with different conditions like the number of epochs, the dataset size, the number of convolutional layers, and image shuffling

INDEPENDENT (AND HYPOTHESES)

<u>CNN</u>

- The dataset portioned to 80% for training, and 20% for testing
- A combination of varying depths where the hand is located is considered. The images are being resized during the preprocessing phase. 6 basic gestures with a total of 12000 images, have been pre-defined and added to separate directories with specific labels.
- 3 layers of convolutional neural networks have been used here
- The input image size is set to 64 pixels
- the video frames captured are preprocessed, resized to the input size of the images fed into the CNN model

<u>Gesture Recognition through Camera</u>

- CamShift algorithm not used due to unnecessary capturing background objects
- OpenCV for background subtraction function to extract the moving foreground mask and segment the hand
- Gaussian Mixture-based Background/Foreground Segmentation Algorithm is used to provide better adaptability to different illuminations and varying scenes.

<u>IoT Device & Central Controller</u>

- Using Arduino. After gesture recognition, python will digitize and send signals to sockets to be identified and then perform tasks.

- 50 epochs are used here with 6000 steps for training and 3000 steps for testing

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- **web camera of 1280x720 pixel resolution**
- **Watershed algorithm to be used for hand segmentation is replaced by the in-built background subtraction algorithm offered by OpenCV due to unnecessary object detection**

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<tr><td>METHODS</td><td colspan="2">ANALYSIS</td></tr>
<tr><td>The dataset creation for the CNN model training and testing is done using a combination of gesture images from both the left hand and the right hand</td><td colspan="2">

- **The video captured by the camera is sent to the central node and performs the main three gesture recognition steps**
- **the central device will perform the relevant command according to the gesture when the central device identified the activity as the gesture after several runs through the CNN model gesture recognition**

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<tr><td colspan="3">FINDINGS</td></tr>
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- **An average accuracy of 99.97% is obtained.**
- **A trained CNN model is used to predict a specific gesture.**
- **The identified gesture code is then sent to the central controller via Bluetooth and the controller further passes to the respective device to be switched on or switched off.**

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<tr><td>FUTURE RECOMMENDATION/GAP</td><td rowspan="2">R
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S</td><td rowspan="2">No task was explain in the paper</td></tr>
<tr><td>to combine an Eyeblink gesture recognition system with the proposed solution in the future. The eye blink gesture recognition system enables the smart devices to be controlled even with a specific eye blink sequence. Eyes are to be detected and the eye blinks are to be recorded and compared with the learning model.</td></tr>
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