American Sign Language (ASL) to Text/Voice

Team Slate8

Top Level Design

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Focused Objectives of ASL

- Background
- Problem Definition
- Current Status of Art
- Solution Approaches
- Top Solution Design

Before there was American Sign Language!

Background

- Communication was little or none
- Discriminated against
- Left out or forgotten
- Lack of confidence
- Being a burden or obligation to someone

National Association of the Deaf (NAD)

Background

- Gave the hearing impaired a voice
- Gave a sense of belonging
- Restored or gave confidence
- Gave a degree of independence
- Communication only with other hearing impaired or through interpreter.

Idea Thinkers (Designers and Inventors)

Current Status of Art

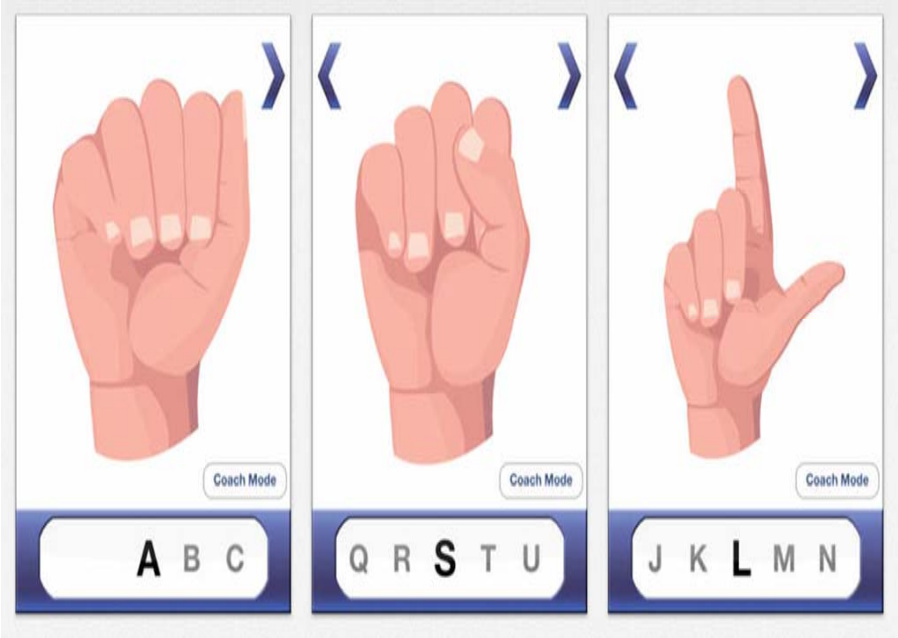
- How can I make communication between the hearing and hearing impaired better?
- I'll use audio or video?
- I'll use audio and video in a stand alone device?
- I will make it portable and convenient
- I will make it user friendly

ASL Designed Devices

Current State of Art

- Teaches Symbol Identification
- Video record with playback interpretation
- Early detection and warnings

American Sign Language App

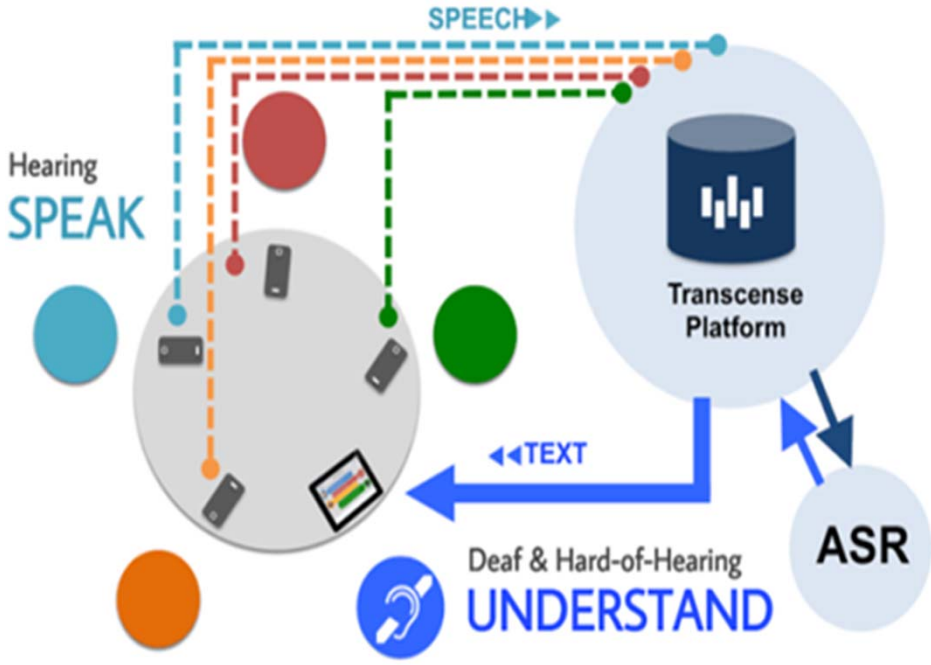


ASL Designed Devices

Current State of Art

- Individual recording devices
- Base station
- Automatic Speech Recognition
- Group Meetings

American Sign Language System

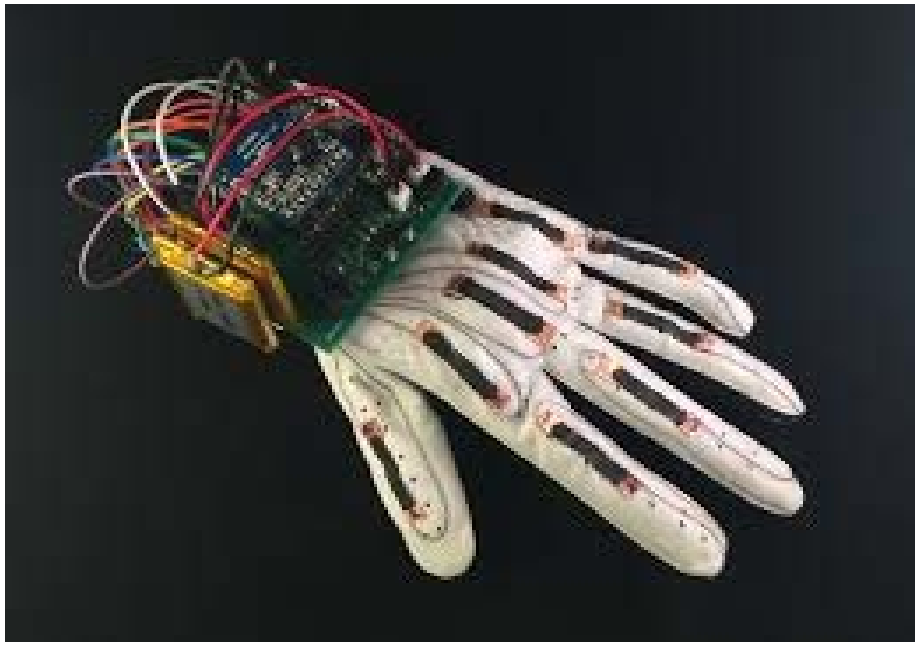


ASL Designed Devices

Current State of Art

- Wirelessly translates the American Sign Language alphabet into text
- Controls a virtual hand to mimic sign language gestures

American Sign Language Glove

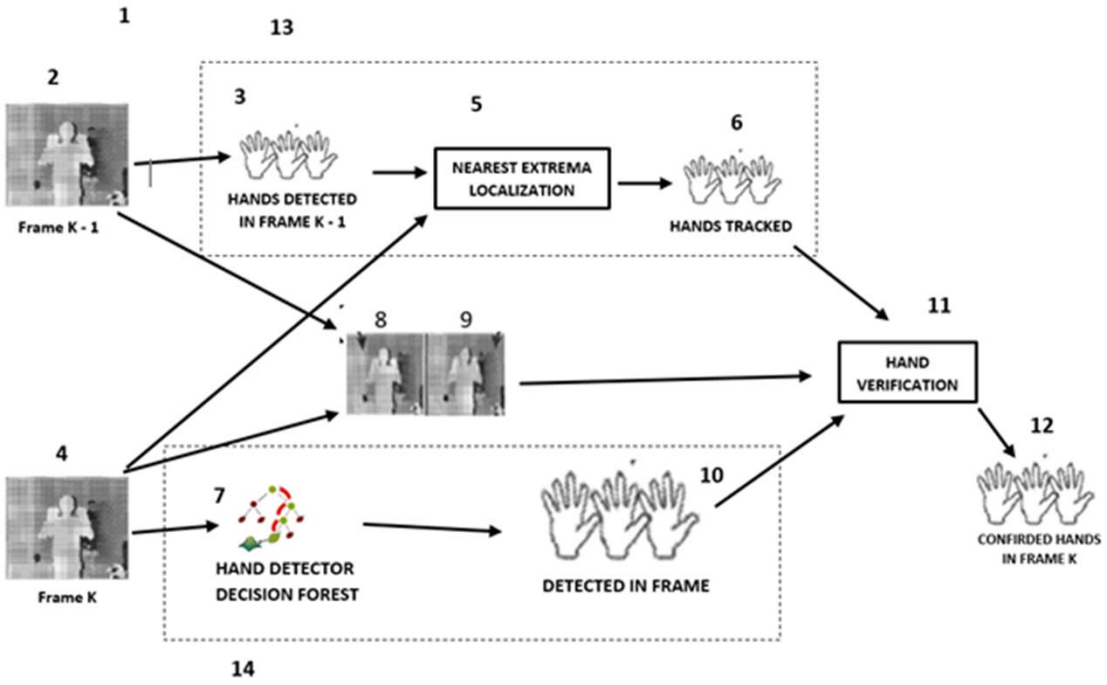


Top Solution Design Solution Approach

Process

- FIG. 1 illustrates shows a model process for performing three dimensional hand tracking using depth sequences.

Three Dimensional Hand Tracking Using Depth Sequences



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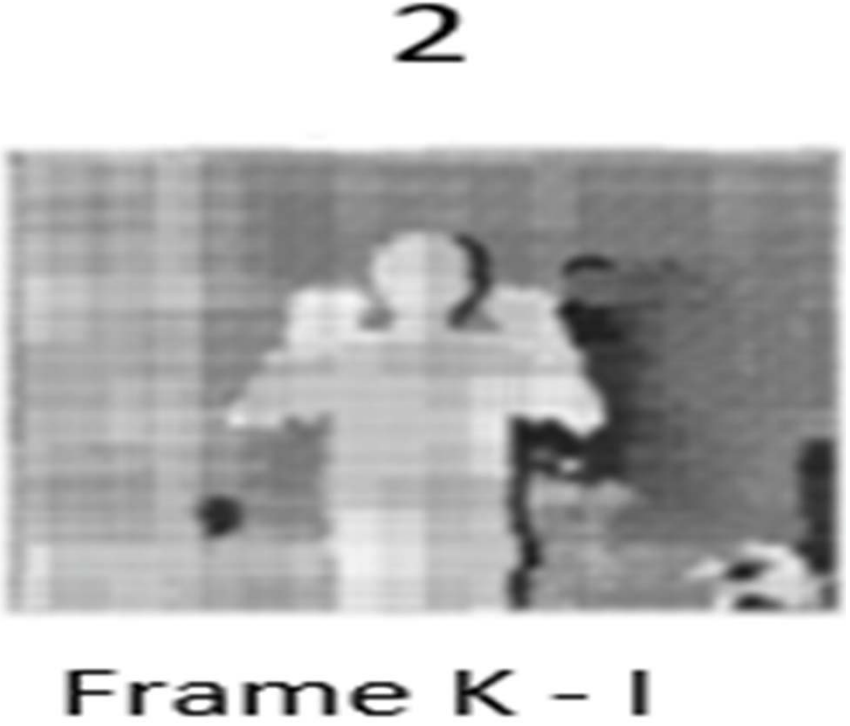
Step One

- First, the depth image for a previous frame (Frame K – I) is analyzed at Step 2.



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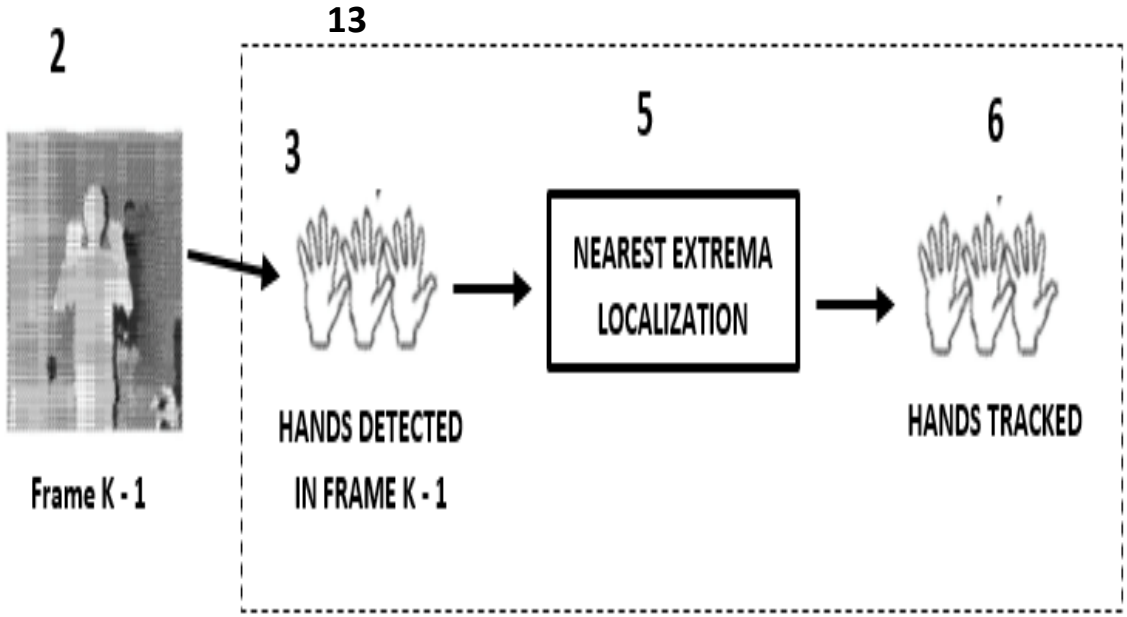
Step Two

- The depth image data for the previous frame may simultaneously be passed to tracking process (13).



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Step Three

- Depth image data is also passed to the motion detection process (8) and background modeling process (9)(for further verification.

8

MOTION DETECTION

9

BACKGOUND MODELING

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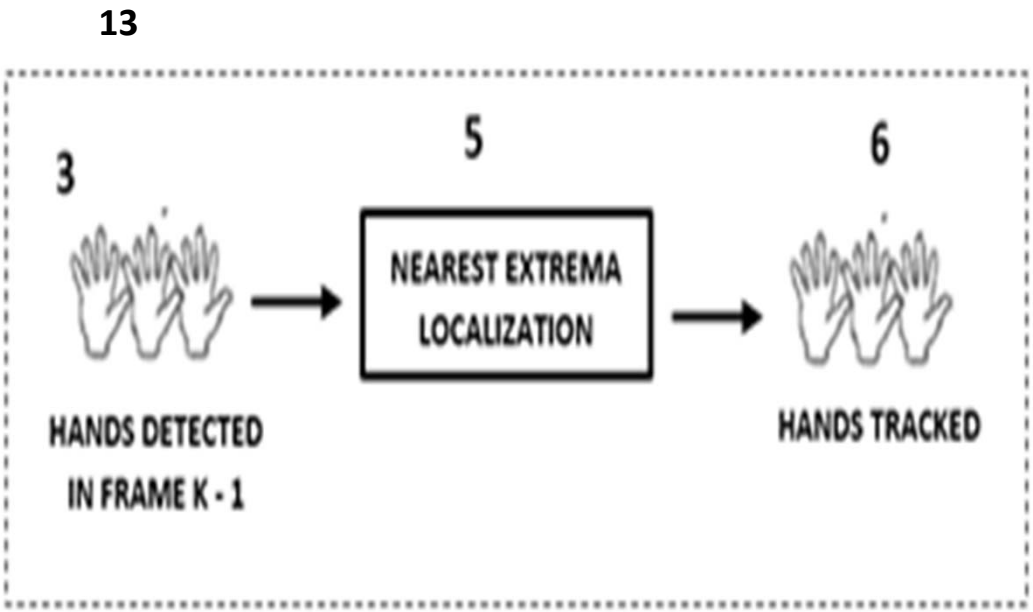
Step Four

- Within tracking process (13), the set of hands detected in the Frame K−1 are obtained (3).



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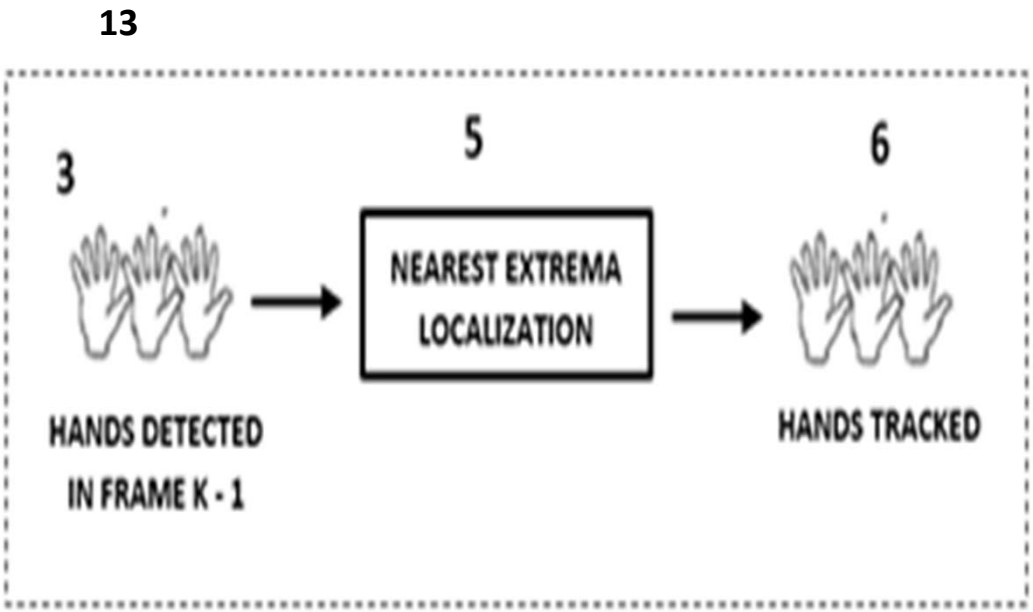
Step Five

- Next, the hands from Frame K−1 and Frame K (i.e., the “current frame”) may be subjected to a nearest extrema localization constraint (5).



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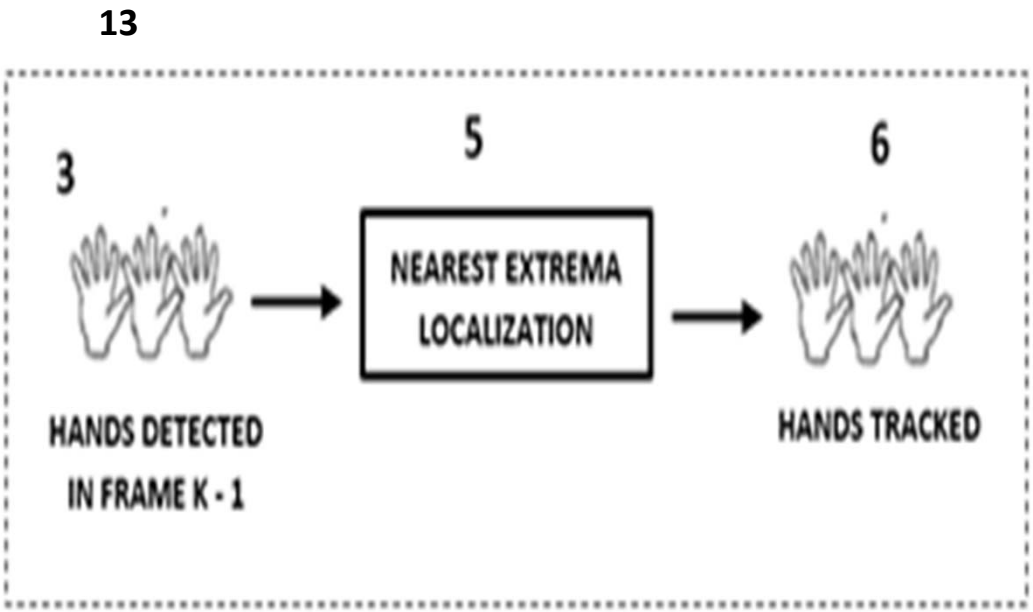
Step Six

- The hands that pass the nearest extrema localization constraint at step (5) are the confirmed set of hands that will be tracked (6) from Frame K−1.



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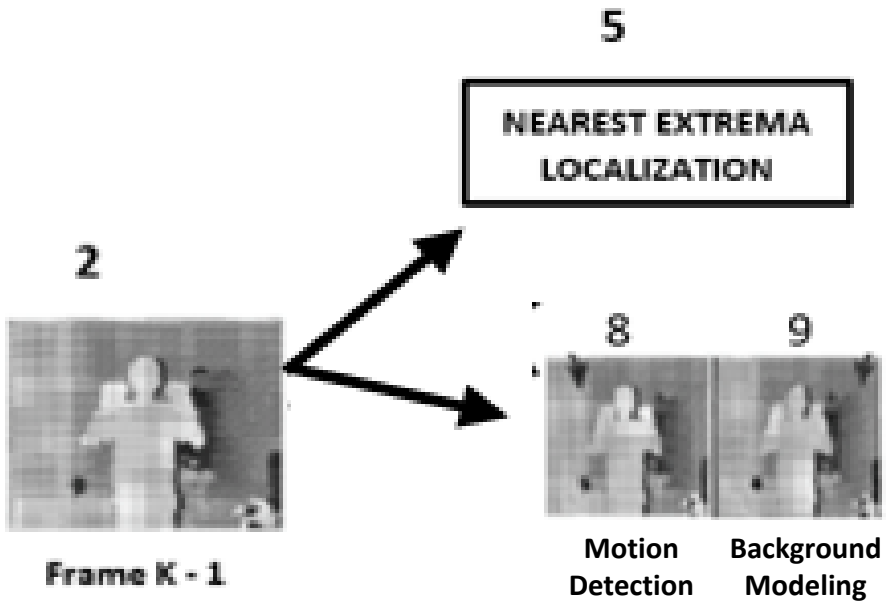
Step Seven

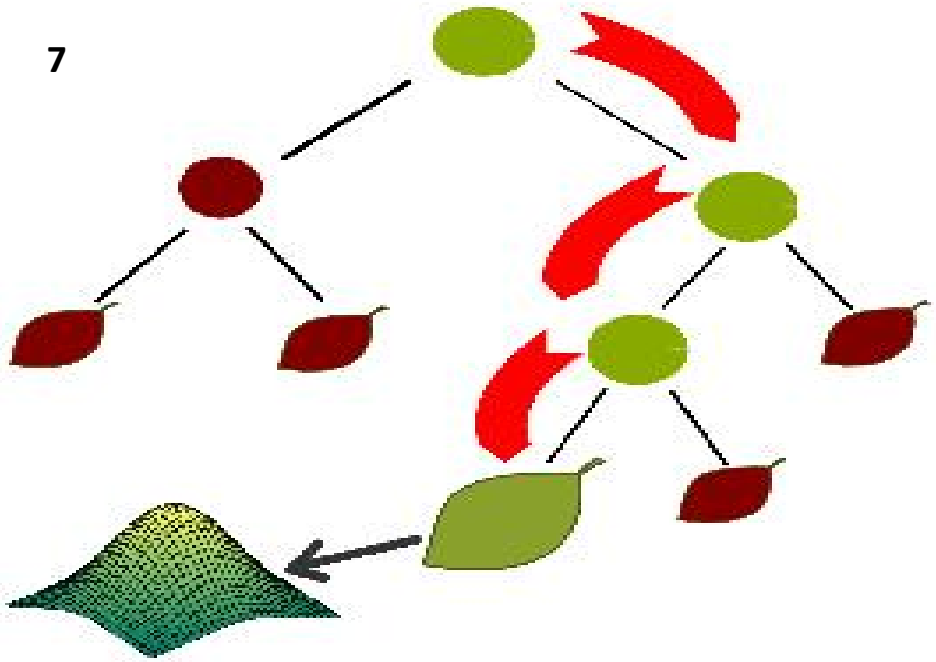
- Like the previous frame (Frame K−1), the information from the current frame (Frame K) may be passed to motion detection process (8) and background modeling process (9).



Top Solution Design Solution Approach

Step Eight

- Finally, each frame, as it becomes the “current frame,” is subjected to the hand detection process 14, which involve the hand detector decision forest (7)



HAND DETECTOR DECISION FOREST

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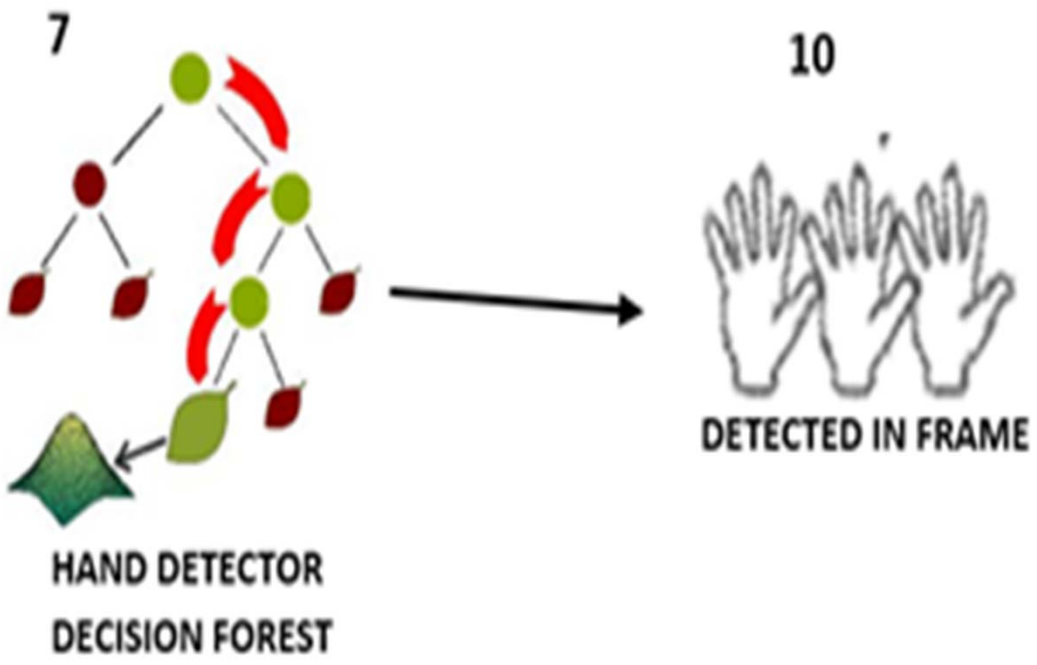
Step Nine

- Hands detected in the decision forest (7) result in a set of candidate hands (10) detected in the "current frame," Frame K.



Top Solution Design Solution Approach

Step Ten

- This output of the current frame hand detection process (14) is then passed to hand verification stage (11).

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Step Eleven

- Finally, the hand candidates that pass the hand verification step (11) are output as confirmed hands in the current frame, Frame K, (12).

CONFIRMED HANDS IN FRAME K

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