Vertical social software for remote collaboration over video

Final presentation

22.02.2016, Nishant Gupta

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Agenda

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A. **Motivation**

B. **Research Questions**

C. **Project Overview, Proposed Solution, Design & Architecture**

D. **Live Demo**

E. **Evaluation**

F. **Future Work**

Collaboration over video – An Example

Amazon’s Mayday feature

Available only on Kindle Fire HDX versions

Motivation

- Is classical video calls sufficient?

- Is classical video calls sufficient?

- Use video collaboration to improve communication and productivity
- Reach the level where people can use natural behaviors to collaborate over video

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Research Questions to be addressed

- What are the scenarios in which remote collaboration over video needs to be implemented?
- What are the existing tools/technologies for remote collaboration over video? What are their limitations with respect to the problem statement?
- How should the design of vertical social software for remote collaboration over video look like?
- What are the metrics for evaluation of implemented artifact for remote collaboration over video?
- Does the evaluation indicate improvement of provided solution over existing tools?

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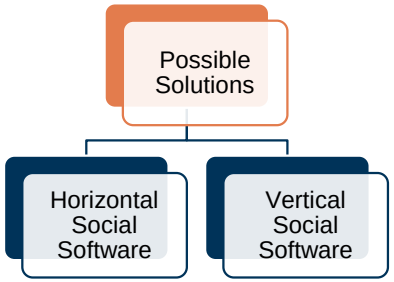
Overview

Problem

Scenarios

- Online Mode
- Offline Mode



Solution

Requirements

- .....
- .....
- ....

Common

- …
- …
- ……

Online Specific

- .....
- …
- ……..

Offline Specific

Existing Solutions

- Facetop
- VideoDraw
- ClearBoard

Research

- Skype
- Hangout
- FaceTime

Tools in market

Comparison

✓		✘
✘		✘
	✓	✓

Architecture

Vertical Social Software

Use case -1

Platform

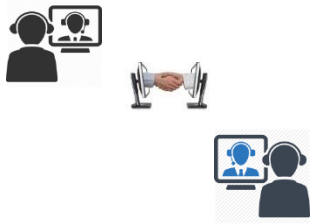
Vertical Social Software

Use case -2

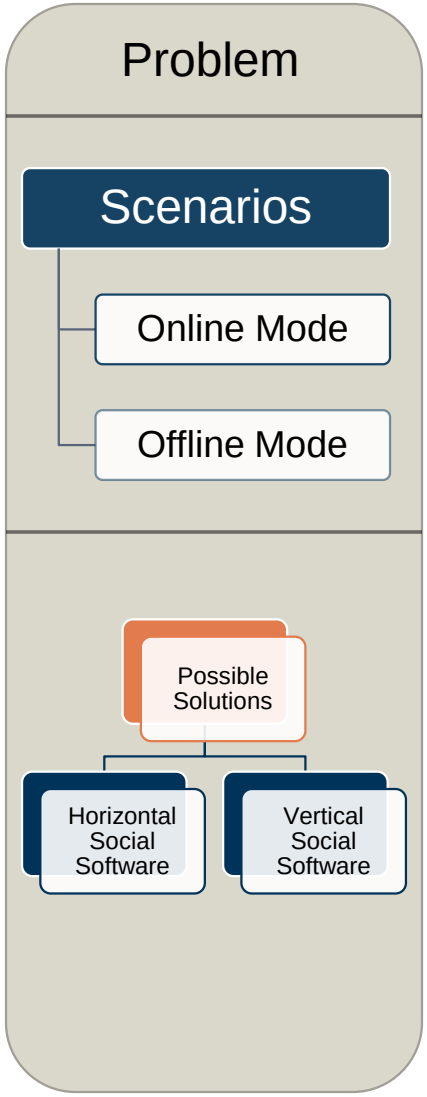
Evaluation

Scenarios

- Real time Assistance
- Offline Support



Problem



Solution

Problem

- Scenarios
  - **Online Mode**
  - Offline Mode

Worker

Internet

Expert

Solution

Problem

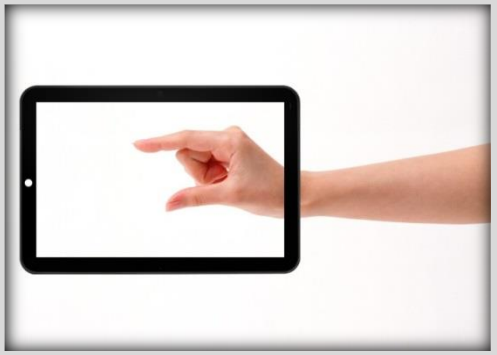
Scenarios

- **Online Mode**
- Offline Mode

- Allows an expert to easily connect with remote clients and support them
- Introduction of hand gestures to improve assistance
- Real time overlapping of expert's hand video over client's desired problem space

What Worker sees

Real time collaboration



Expert assisting

Solution

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Problem

Scenarios

- **Online Mode**
- Offline Mode

Features

Real time assistance

Communication possible using hand gestures or finger pointing

Suitable for use cases requiring urgent help

More natural and intuitive form of help

Solution

Problem

Scenarios

- Online Mode
- **Offline Mode**

Worker

Solution

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Problem

Scenarios

- Online Mode
- **Offline Mode**

Possible Solutions

- Horizontal Social Software
- Vertical Social Software

Worker

Solution

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Problem

Scenarios

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Worker

Recorded Video

Solution

Problem

Scenarios

- Online Mode
- **Offline Mode**

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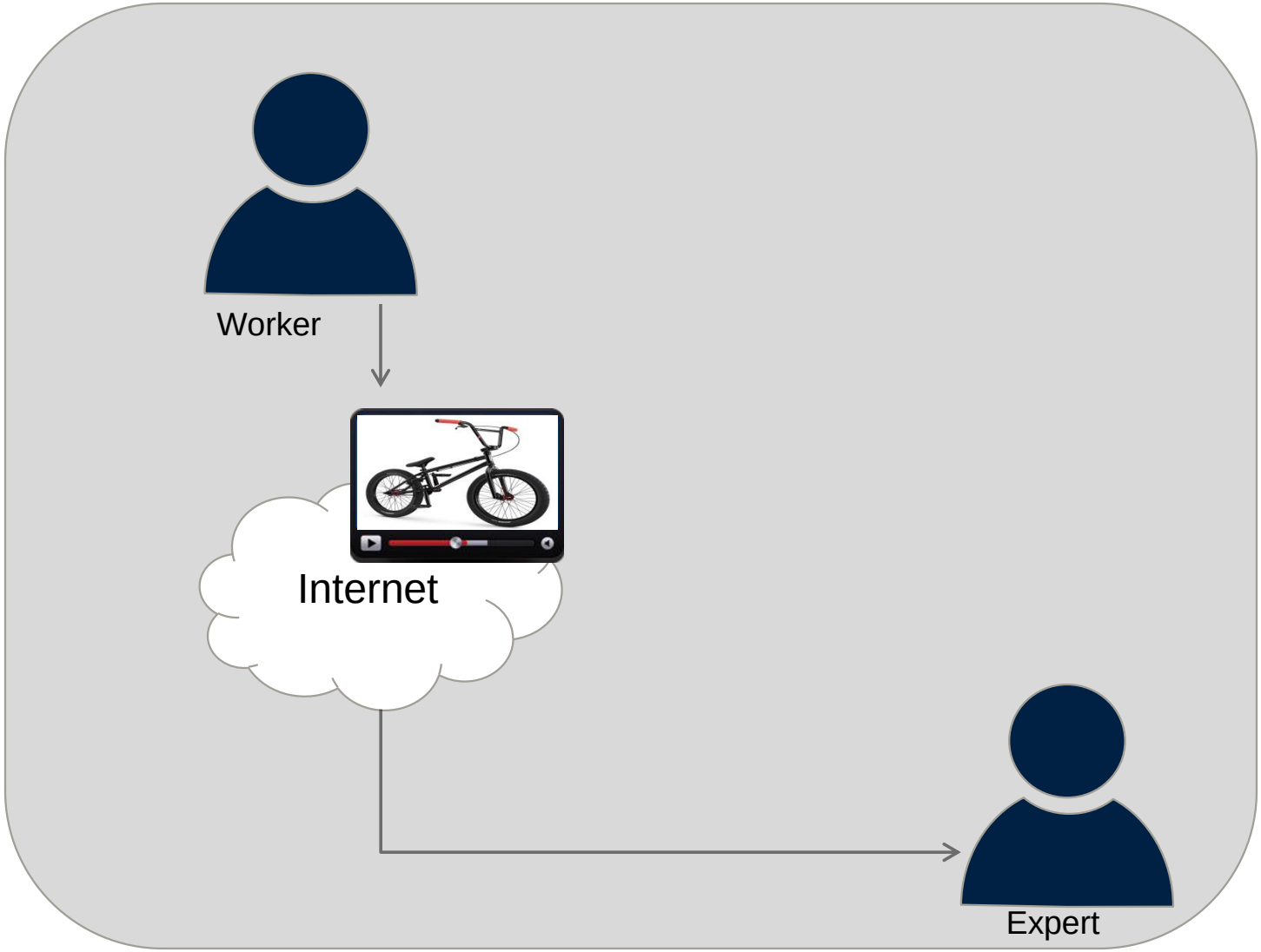

Solution

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Scenarios

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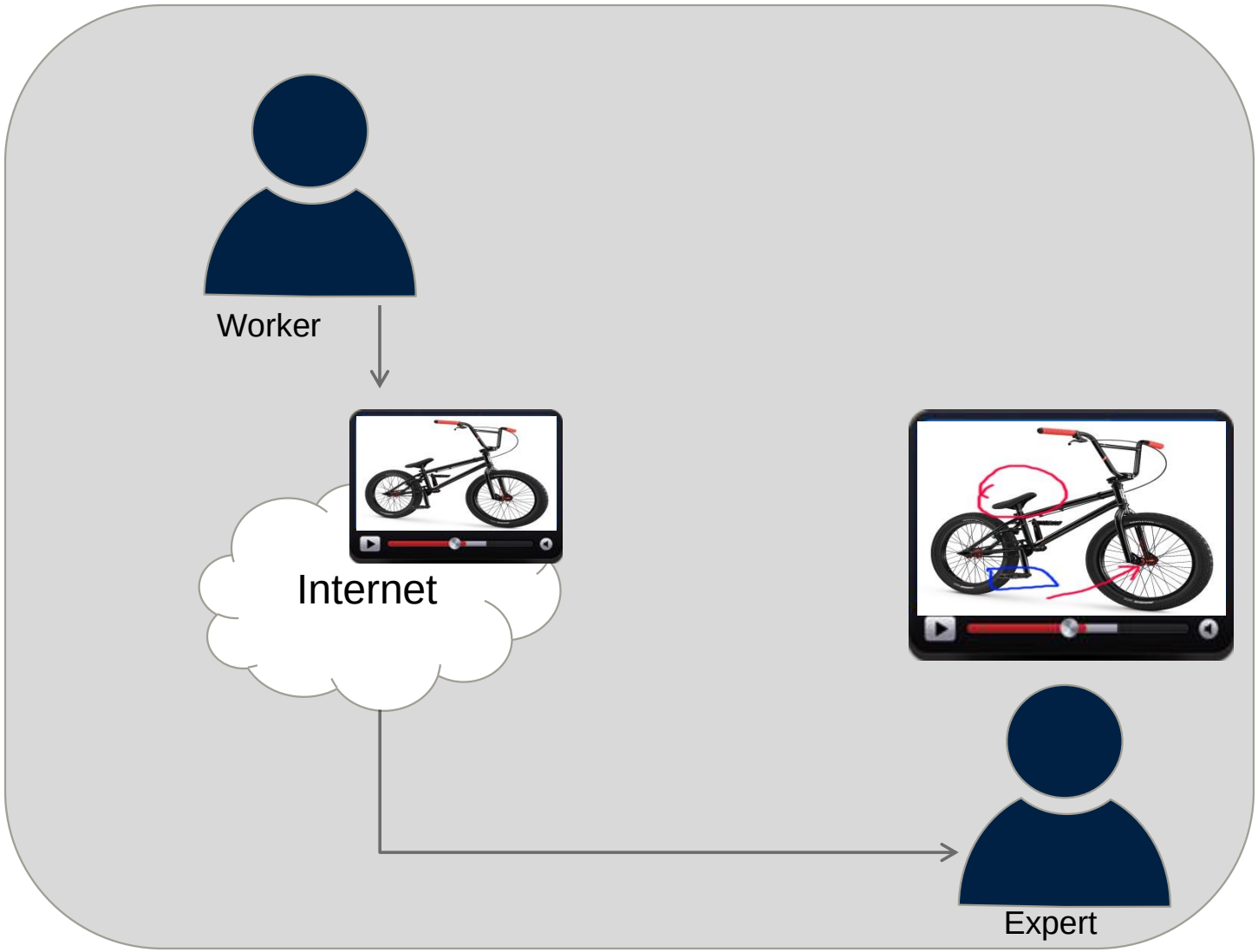
- **Offline Mode**

Possible Solutions

- Horizontal Social Software
- Vertical Social Software



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- Horizontal Social Software
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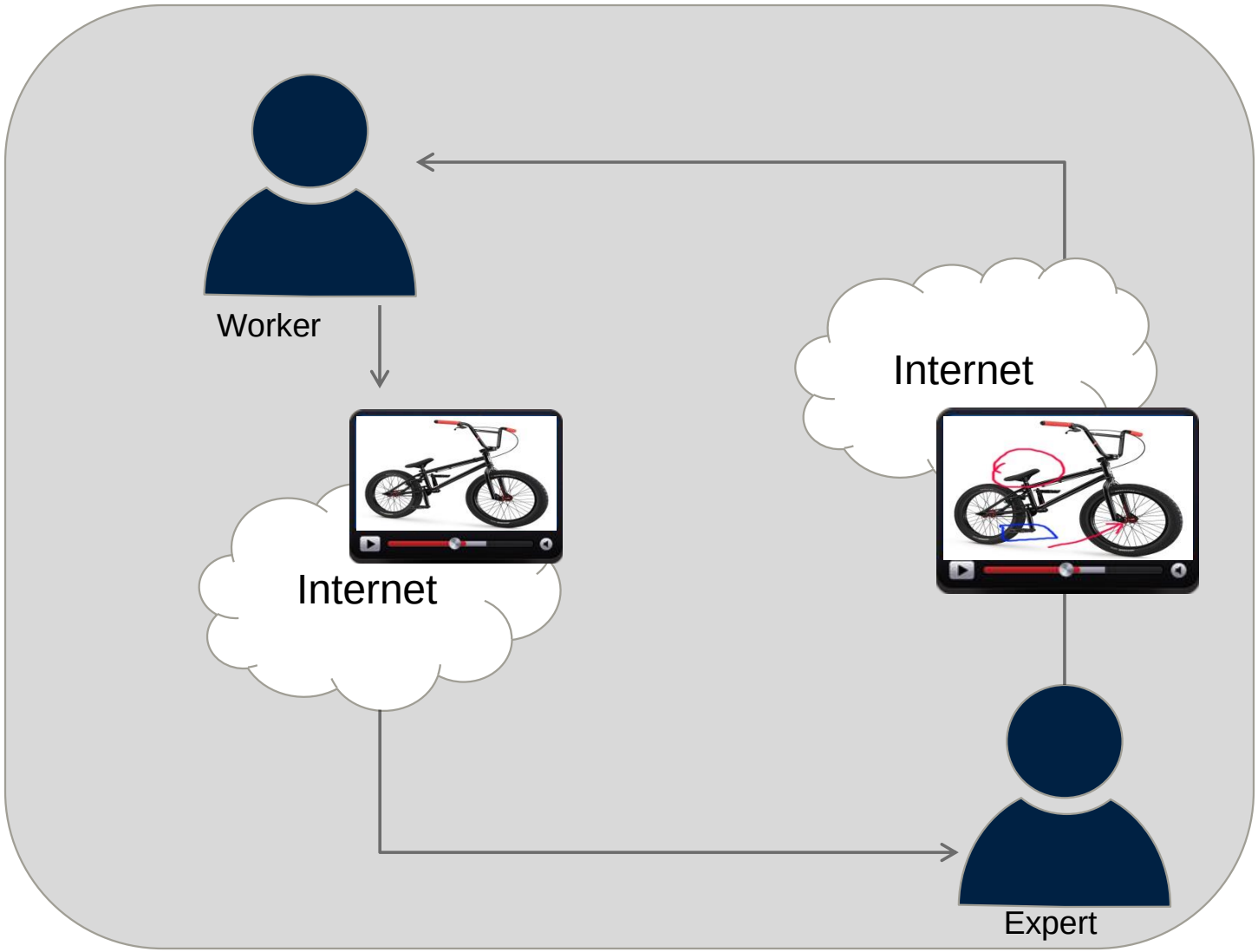

Solution

Problem

Scenarios

- Online Mode
- **Offline Mode**

Possible Solutions

- Horizontal Social Software
- Vertical Social Software

Worker

Internet

Internet

Expert

Solution

Problem

Scenarios

- Online Mode
- **Offline Mode**

Features

More detailed and explanatory

Better analysis possible by pausing the video

Possible to draw strokes over video

Suitable for sites with no internet connection

Overview

Problem

Scenarios

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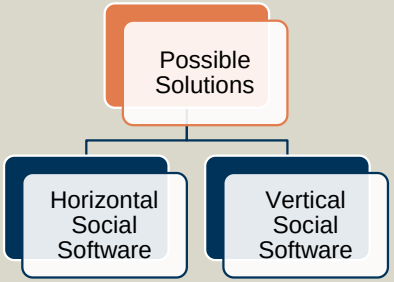
- Offline Mode



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Offline Specific

Existing Solutions

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Tools in market

Comparison

✓		✘
✘		✘
	✓	✓

Architecture

Vertical Social Software

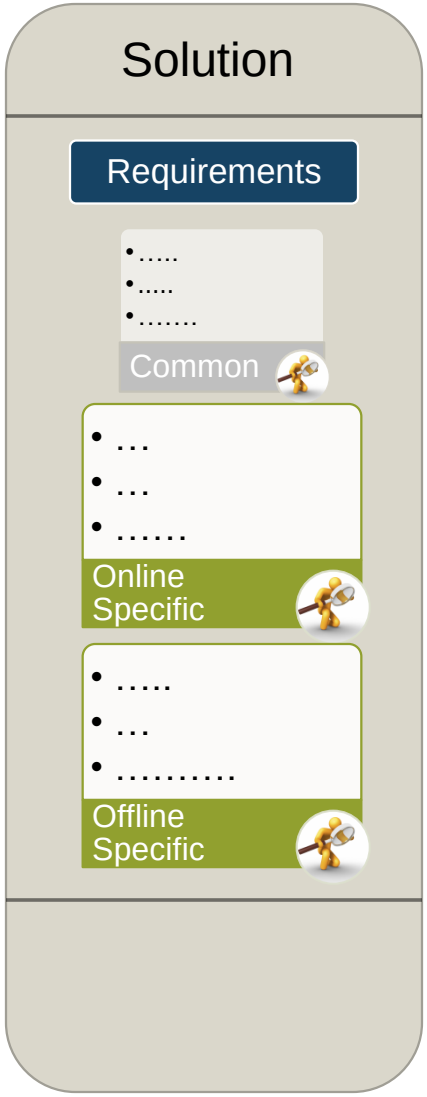
Use case -1

Platform

Vertical Social Software

Use case -2

Scenarios - Requirements



Online Mode

- Start / answer a video call
- Access the camera and get the live feed
- Render and play feed on browser window
- Provide real-time hand segmentation
- overlap segmented hand video over original feed

Offline Mode

- Access the camera and get the live feed
- Render and play feed on browser window
- Save live feed as a video
- Get recorded video from local directory
- Video player with feature to play / pause recorded video
- Drawing tools for annotating objects in video
- Create refactored video based on annotations
- Save the refactored video

Existing Solutions

sebis

Solution

Existing Solutions

- Facetop
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Research

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- Hangout
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Tools in market

Comparison

✓		✗
✗		✗
	✓	✓

Tools in Market

- Skype
- Google Hangout
- FaceTime

Research Work

- Drawing Over Video Environment (DOVE)
- CollaBoard
- VideoArms
- ClearBoard
- HandsInAir

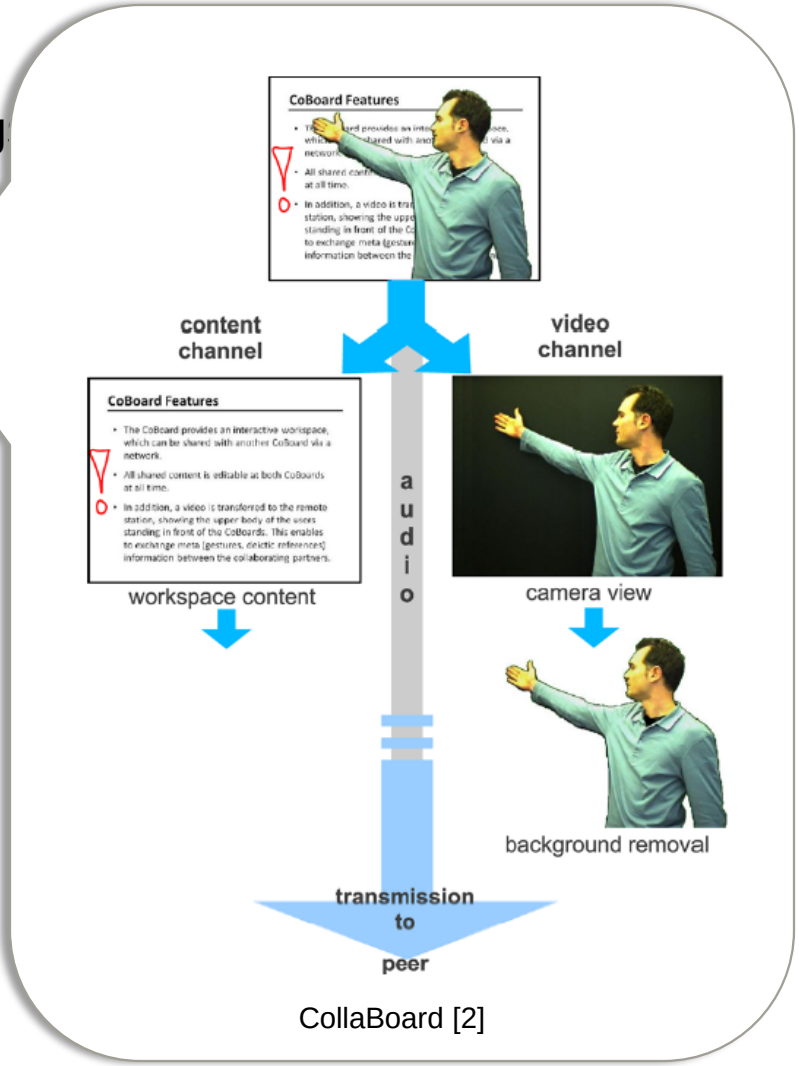
Current technologies for collaboration over video

- Classical way of video conferencing
- **Use of markers/pen tools for sharing drawings**
- Video over[illegible]ver another video
- [illegible]

Drawing Over Video Environment (DOVE) [1]

Current technologies for collaboration over video

- Classical way of video conferencing
- Use of markers/pen tools for sharing drawing
- **Video overlaid over another video**
- Gestures projection
- Wearable tools for mobile users



CollaBoard [2]

Current technologies for collaboration over video

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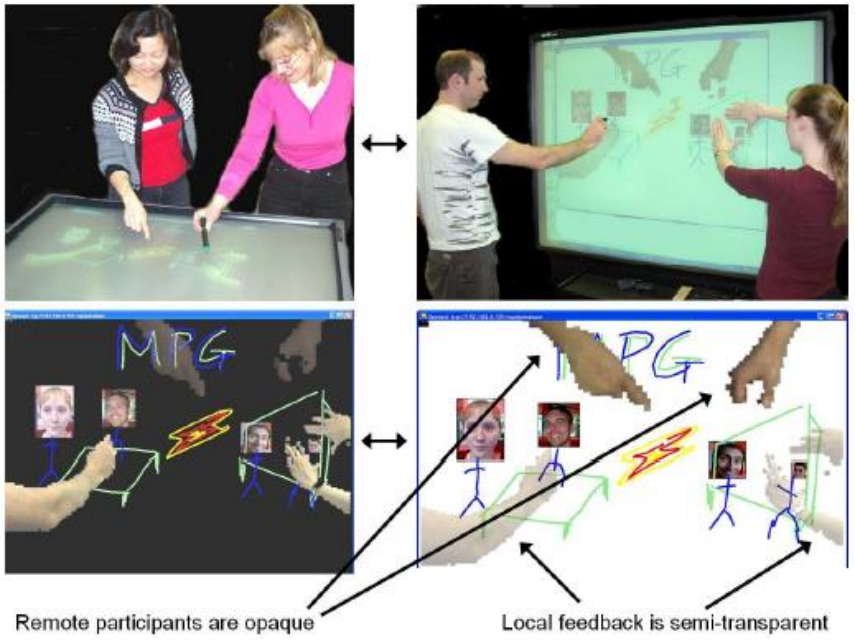
- Video overlaid over another vi
- **Gestures projection**
- Wearable tools for mobile use



VideoArms [3]

Current technologies for collaboration over video

- Classical way of video conferencing
- Use of markers/pen tools for sharing drawings
- Video overlaid over another video
- Gestures projection
- Glass panes for eye contact
- **Wearable tools for mobile users**

HandsInAir [5]

1. A work scene captured by the worker camera

2. A hand gesture captured by the helper camera

3. Combination of the gesture and the scene

HandsInAir [5]

Existing Solutions

sebis

Solution

Existing Solutions

- Facetop
- VideoDraw
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Research

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Tools in market

Comparison

✓		✗
✗		✗
	✓	✓

	DOVE	CollaBoard	VideoArms	ClearBoard	HandsInAir
Real-Time Support	✓	✓	✓	✓	✓
Hand Gestural Communication	✗	✓	✓	✗	✓
Offline Support	✗	✗	✗	✗	✗
Works in Mobile Environment	✗	✗	✗	✗	✓
Drawing Tools / Annotation	✓	✗	✓	✓	✗

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D. **Demo**

E. **Evaluation**

F. **Conclusion & Future Work**

Offline Support

Real time assistance

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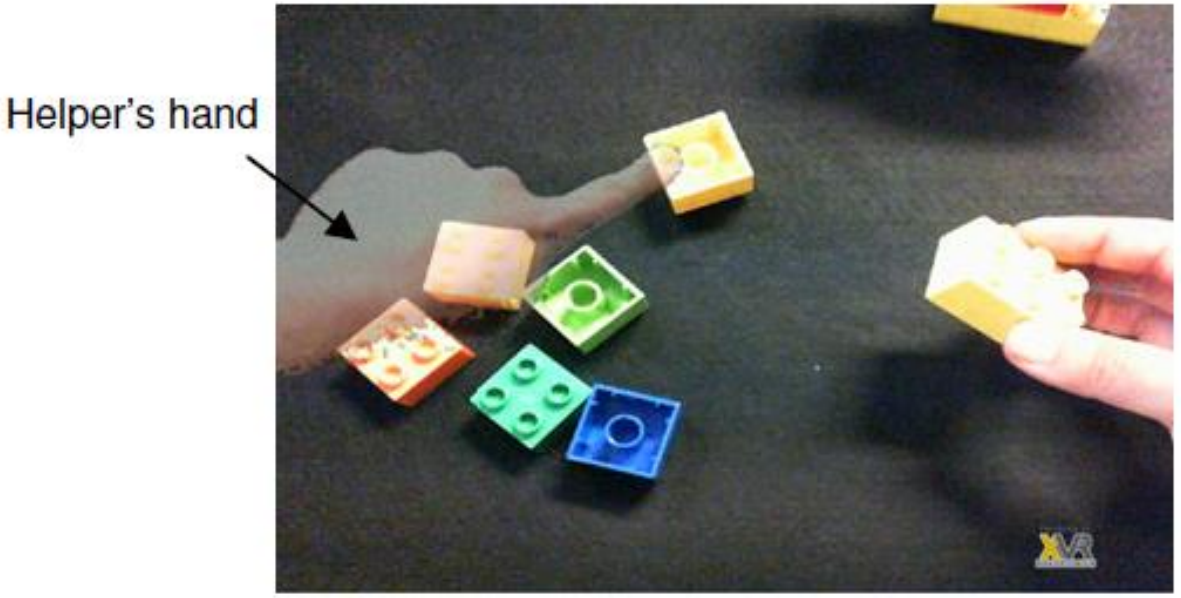
Experimental Observations

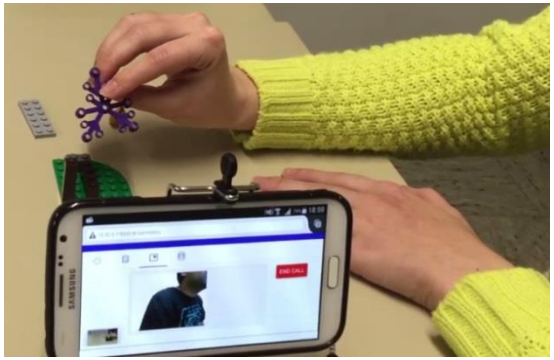
Remote assistance

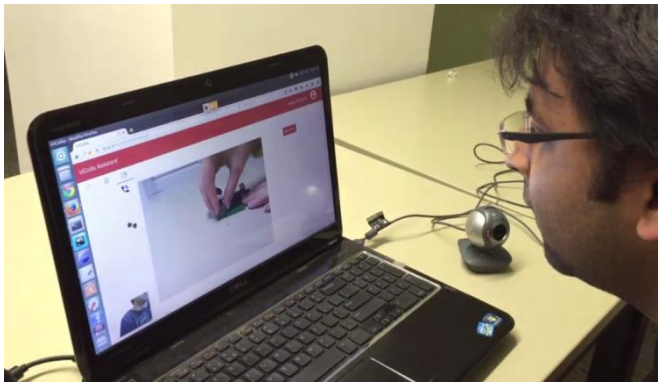
- Technical help for physical tasks
- Home office more feasible



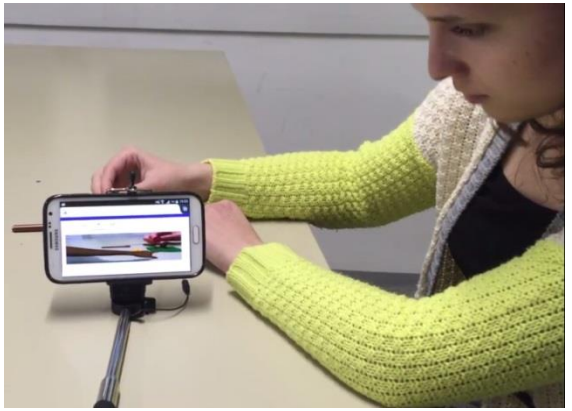
HandsOnVideo [6]

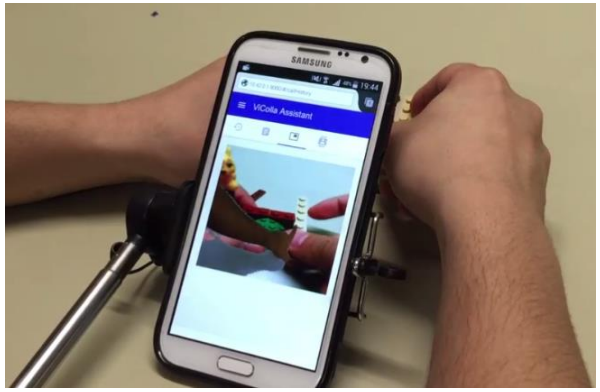
Experimental Observations





Experimental Observations





Feedback

Prototype

Vertical Social Software Solutions

Real Time Remote Assistance

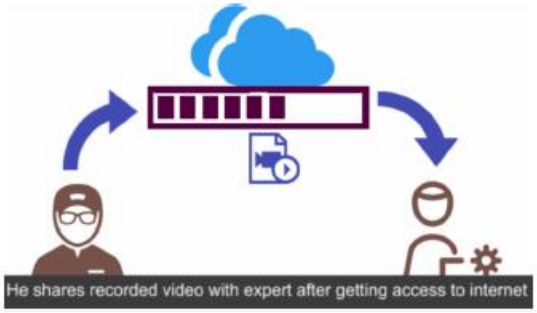
Offline Assistance

Operating an elevator – Online Scenario

Prototype

Setting up a router – Offline Scenario

Prototype



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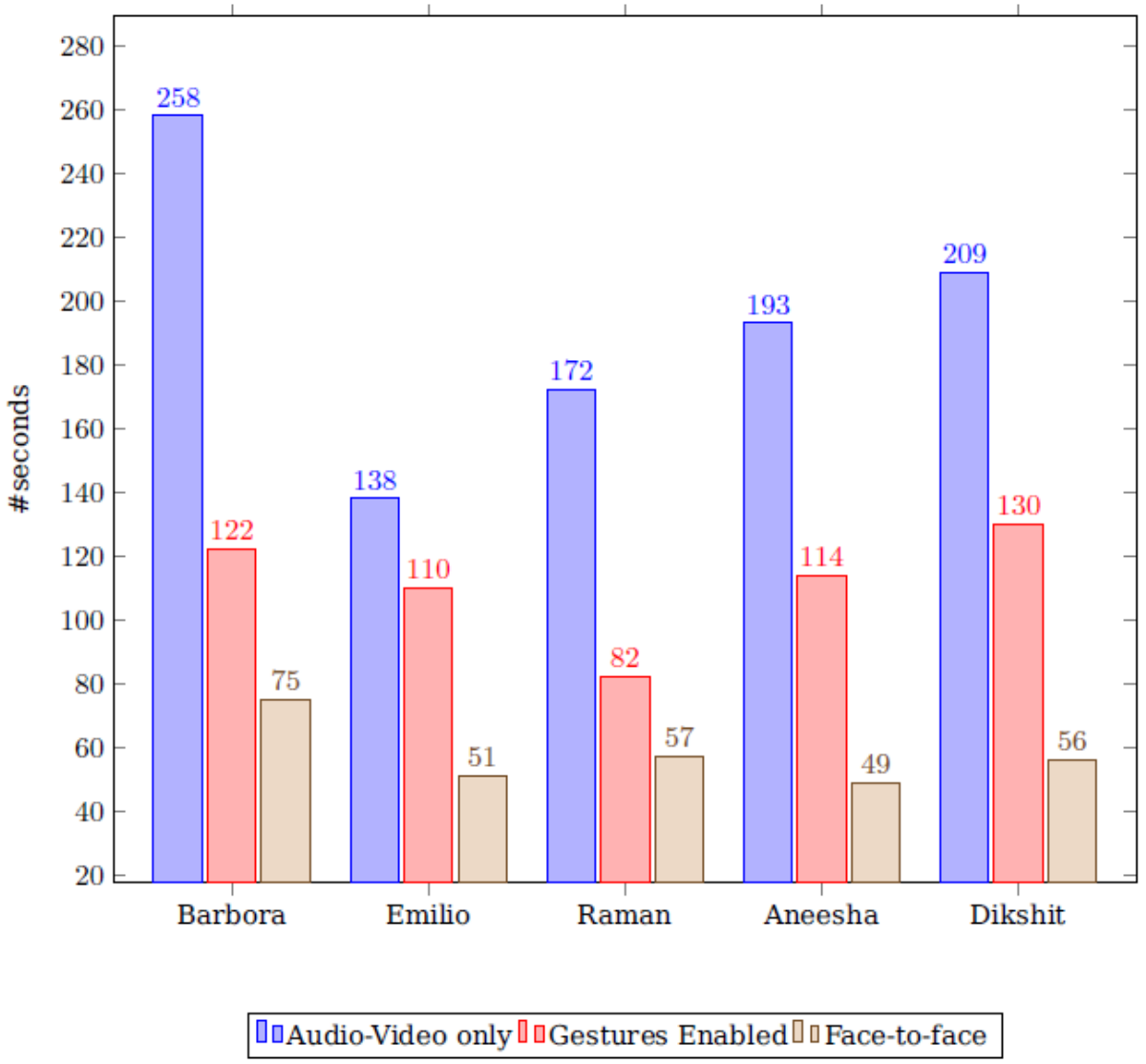
Conclusion

Impact of different Collaboration conditions

Average Time

AV only - 3m 14s
Gestures enabled – 1m 56s
Face to face – 58s



Conclusion contd..

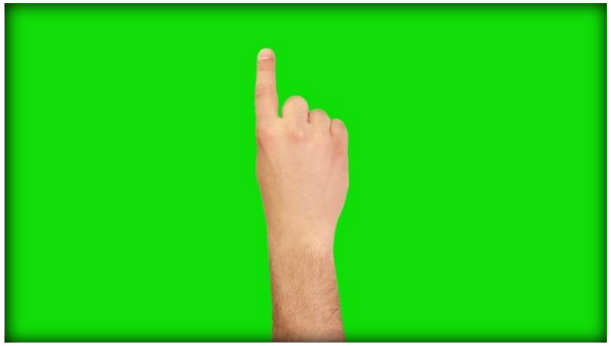
Real time observations and video recordings interpretations

- Audio plays significant role with gestures
- Stable holder for smart-phone increases efficiency – mobile user can use both hands
- Other factors like User's experience with smart phones, device's orientation (portrait or landscape) also impacts result

Future Work

Make it compatible with non uniform backgrounds

Using plain white background

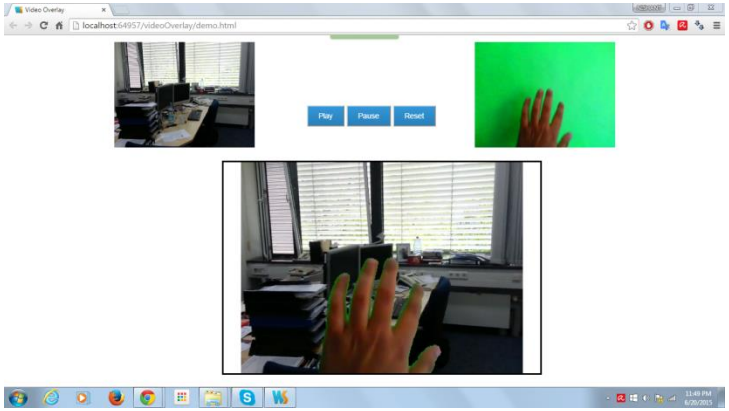


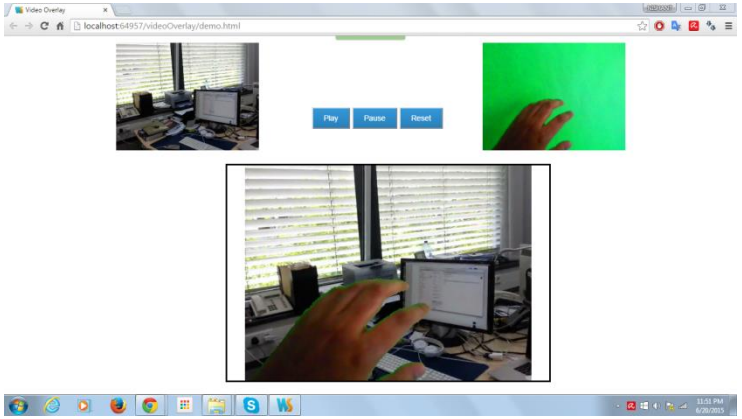
Using Chroma Key – Green background used worldwide for background manipulation

Using whitish/gray wall as background

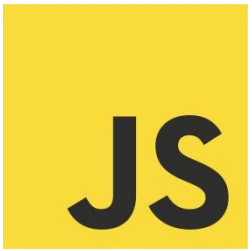
Future Work contd..

- Improved hand segmentation (e.g. take care of shadows)
- Download annotations
- Differentiate annotations based on the name of creator
- Allow non-experts to draw annotations





Proposed technologies



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[1]. Ou, Jiazhi, et al. "DOVE: Drawing over video environment." *Proceedings of the eleventh ACM international conference on Multimedia*. ACM, 2003.

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[4]. Ishii, Hiroshi, and Minoru Kobayashi. "ClearBoard: a seamless medium for shared drawing and conversation with eye contact." *Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM, 1992.

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[6]. Huang, Weidong, and Leila Alem. "Supporting hand gestures in mobile remote collaboration: a usability evaluation." *Proceedings of the 25th BCS Conference on Human-Computer Interaction*. British Computer Society, 2011.

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Thank You!