

# Visualization of Environment-related Information in Augmented Reality: Analysis of Users' Needs

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**‘Influence of Cartographic Visualization Methods on the Success of Solving Practical and Educational Spatial Tasks.’**



- Method & Procedure
- Results
- Future Research

## OBJECTIVES

- INVESTIGATE WHAT INFORMATION ARE CURRENTLY AVAILABLE TO PARAGLIDING PILOTS
- INVESTIGATE WHAT INFORMATION IS MISSING
- AND WHAT INFORMATION WOULD BE APPROPRIATE TO DISPLAY IN AUGMENTED REALITY (AR)



**Vuzix M100**

## METHOD

- Descriptive study (subjective) on how the AR information can be used within the paragliding flight

## PROCEDURE

- Semi-structured interview
  - Questionnaire on what information have pilots available, what are the information they need before/during the flight
  - Focus on identifying areas where AR could help
- User test
  - One user took Vuzix M100 to real paragliding flight
  - The compass was presented on on the glasses(showing the user North and the deviation from it)
  - The user was asked on experience via questionnaire

## TECHNICAL CHARACTERISTICS

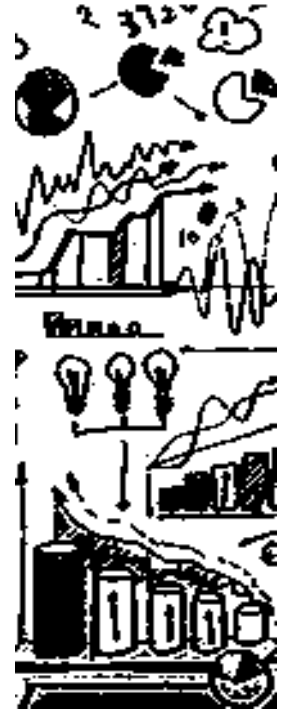
- General
  - Aspect ratio: 16:9, 1 GB RAM
  - Android ICS 4.04, API 15
  - Field of view (diagonal): 15°, equiv. to 4 in. mobile device screen
- Connectivity
  - Micro USB, Wi-Fi 802.11b/g/n, Bluetooth, Micro 3D up to 32 GB
- Display
  - Video see-through
  - Image from camera repeated once again in glasses instead of seeing the surrounding directly
- Integrated Head Tracker
  - 3 DOF head tracking
  - 3 axis gyro, accelerometer, magnetometer/compass
- Battery
  - 550 mAh rechargeable internal
  - 2 hours hands free + display
  - 1 hour hands free + display + camera
- Camera
  - 5 megapixel stills, 1080p video
- Hands free
  - Ear speaker, Dual noise cancelling microphone

## PARAGLIDING – OVERVIEW

- Highest altitude approx. 3km (10 000ft)
- Average altitude approx. 2km (6 500ft)
- Use of radio for communication

## INFORMATION NEEDED

- Map + GPS
- Forward speed
- Gliding angle (+ distance)
- Vario (rate of climb and descent indicator)
- Altitude (paraglider's height over sea level)



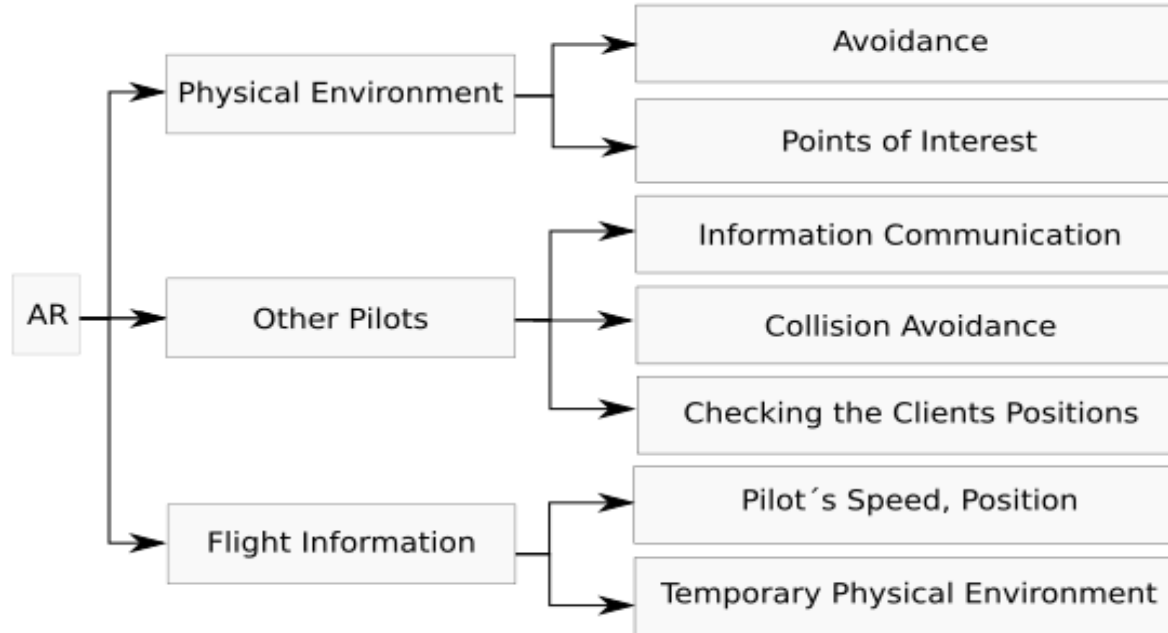


## AREAS OF APPLICATION

- 1. Performance flying
- 2. Training
- 3. Safety purposes

## INFORMATION CATEGORIES

- Static/dynamic information
- Textual/graphical information
- Non-interactive/interactive visualization



**Benefits of AR use during the paragliding**

## USER EXPERIENCE

- Glasses covers too much Field of view (FOV) – M100 are not see-through display
- + Lightweight
- + Ability to rotate the head to see terrain behind the glasses



## INTERACTION

- Set up the device on the ground
- Only screen switch should be used during the flight

## DISPLAY

- See-through display should be used

## INFORMATION VISUALIZATION

- As information is related to pilot's air surrounding <- preference in displaying the information right in front of paragliding pilot
- Terrain should be overlaid with terrain-related data
- Information appropriate for depiction in glasses should be carefully selected

=> NEEDS TO BE INVESTIGATED 1<sup>ST</sup> STEP

=> NEEDS TO BE INVESTIGATED 2<sup>ND</sup> STEP

## INFORMATION RELATED TO THE FLIGHT/PILOT

- Identified as easier solution – data we have can be just visualized in front of user eyes
- Focus on the position of information relative to user and format of information in the glasses
- Possible cooperation with other university

## INFORMATION RELATED TO THE ENVIRONMENT

- More complex solution
- Desires proper alignment of the objects
- Possible cooperation with other university



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# THANK YOU

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