

Supplemental Material for the CHI 2021 publication:

Ricardo Langner, Marc Satkowski, Wolfgang Büschel, and Raimund Dachzelt. 2021.
MARVIS: Combining Mobile Devices and Augmented Reality for Visual Data Analysis.
In CHI Conference on Human Factors in Computing Systems (CHI '21), May 8–13, 2021,
Yokohama, Japan. ACM, New York, NY, USA. <https://doi.org/10.1145/3411764.3445593>.

Supplemental Material

(Material presented in this PDF is also available on the project's website: <https://imld.de/marvis>)

Participants' Expertise

The following table gives an overview of the self-assessed expertise. Values are as follows: 1 - no experience, 2 - low experience, 3 - moderate experience, 4 - advanced experience, 5 - expert-level experience.

	Data visualization		Mobile devices and other touch-enabled devices		Augmented reality	
	Using ^(a)	Develop ^(b)	Using ^(c)	Develop for ^(d)	Using ^(e)	Develop for ^(f)
Expert 1	3	3	5	4	3	2
Expert 2	4	2	3	2	2	1
Expert 3	3	5	2	1	5	5
Expert 4	4	4	4	4	2	2
Expert 5	3	2	4	3,5 ^(g)	3	3,5 ^(g)
Expert 6	3	2	4	4	4	4
Expert 7	5	5	4	5	3	2

(a) Experience with the use of data visualizations

(b) Experience with developing or creating data visualizations

(c) Experience with the use of modern mobile devices and other touch-enabled devices/displays

(d) Experience with developing or creating applications for modern mobile devices and other touch-enabled devices/displays

(e) Experience with the use of augmented reality applications or hardware

(f) Experience with developing or creating augmented reality applications

(g) The participant could not decide on one of the values.

Grouped Comments from Expert Interviews (Design Phase)

The following table lists all 16 grouped comments (sorted by the number of total mentions) collected during semi-structured interviews in the design phase. Columns I1 to I7 represent the seven interviewed experts.

	I1	I2	I3	I4	I5	I6	I7	COUNT
AR provides context information based on what is shown on mobiles (e.g., F+C)	x	x	x	x	x	x	x	7
Use AR to enable multi-user functionality (e.g., shared areas)	x	x		x	x	x	x	6
Mobiles are already established	x		x		x	x	x	5
Show AR content flat on a surface or one the same level as mobiles		x	x		x	x	x	5
Use smartphones (smaller devices) as controllers and for menus	x	x			x	x	x	5
Use AR to showing relations between views/devices	x	x	x	x			x	5
Use spatial movement of devices for interaction (e.g., slicing, peephole)		x	x		x		x	4
Use AR for 3D information	x		x	x			x	4
Spatial awareness to enable seamless AR alignment		x	x		x			3
Priority on touch interaction on mobiles	x	x						2
Tangibility of mobiles		x			x			2
Use spatial awareness for spatial device arrangements	x	x						2
Arrange and tilt AR views/displays in the space around and behind a mobile	x					x		2
Show AR information on demand	x					x		2
Symmetric interaction with touch and mid-air	x							1
Use AR for 2D information	x							1