Appendix Table. Comparison of features of smart wheelchairs.

	75 Sensors								Manning				Operating Modes													
	75				Sensors	<b>N</b> 1 <b>V</b>						Mapping	-			a w :	***			• • •	-	0		<b>.</b>		<u> </u>
Smart Wheelchair	Sonar Infra	red Laser Rangefinder	Laser Cor er Striper V	omputer Vision	ump/Contact F	Dead Li Reckoning Follo	ne wing Co	ompass GPS	Gyroscope	Topological	Metric (	Occupancy Grid		Artificial Landmarks	Autonomous Navigation			Door Passage	Docking P	ajectory ayback T	Reverse rajectory	Farget Tracking	Line <sup>g</sup> Following	Turn- in- T place	hree-point Bu Turn B	imp and Backup
Automated-Guided Wheelchair-NEC Corporation, Japa	Х					У	2																Х			
Autonomous Wheelchair-Arizona State University, U	Х			Х		Х				Х				Х			Х									
CHARHM-Advanced Technologies Development Center, Alger				Х							Х				Х											
COACH—French Atomic Energy Comission, Franc	X X															Х	Х									
CWA-National University of Singapore, Singapore (Manua						Х														Х						
CWA (Power)						Х														Х						
CCPWNS—University of Notre Dame, US				Х		Х								Х						Х						
Hephaestus—TRAC Labs, US	Х				Х											Х										
INCH—Yale University, US	Х					Х										Х										
INRO-FH Ravensburg-Weingarten, German	Х		Х			Х		Х			Х				Х							Х				
Intelligent Wheelchair System—Osaka University, Japan (prototype	Х			Х		Х					Х					Х	Х					Х				
Intelligent Wheelchair System (prototype 2	Х			Х												Х	Х					Х				
Intelligent Wheelchair-University of Texas at Austin, U	X X			Х	Х	Х				Х	Х				X*											
Luoson III-National Chung Cheng University, Taiwa	Х			Х		Х		Х														Х				
MAid—RIAKP, Germany	X X	Х				Х			Х		Х	Х		Х	Х							Х				
Mister Ed—IBM, US	X X				Х	Х										Х	Х	Х				Х				
Mr. HURI—Yonsei University, Korea	Х			Х												Х										
NavChair—University of Michigan, U	Х					Х						Х				Х	Х	Х								
NLPR Robotized Wheelchair-Chinese Academy of Sciences, Chin	Х			Х		Х					Х		Х		Х	Х	Х									
OMNI—University at Hagen, German	X X				Х	Х										Х	$X^*$	$X^*$	$X^*$	Х	Х					
Orpheus-National Technical University of Athens, Greec	Х					Х					Х				Х	Х										
Phaeton-Northeastern University, US	Х			Х	Х	Х											Х					Х				
RobChair—University of Coimbra, Portuga	X X				Х											Х	Х									
Robotic Wheelchair-FORTH, Greec	Х			Х		Х										Х						Х				
Rolland—University of Bremen, Germany (prototype	X X			Х	Х	Х						Х		Х		Х	Х	Х		Х						
Rolland (prototype 2 with laser		Х				Х					Х				Х											
Rolland (prototype 2	Х					Х				Х	Х	Х				Х	Х	Х		Х				Х		/
SENARIO—TIDE, Finland	Х	Х			Х	Х				Х	Х	Х			Х	Х										
Siamo—University of Alcala, Spai	X X		Х	Х	Х	Х					Х			Х	Х	Х	Х	Х	Х			Х				/
SIRIUS—University of Seville, Spair	Х					Х										Х					Х					
Smart Alec—Stanford University, U	Х					Х										Х	Х					Х				
Smart Wheelchair																										
CALL Center, UK	Х				Х	У	[																Х			Х
Chinese University of Hong Kong, Chin	Х																			Х						
Kanazawa University, Japa						Х					Х			Х	Х											/
Toyohashi University, Japa	X X				Х							Х				Х										
University of Ancona, Ital	Х					X						Х				Х										/
University of Plymouth, UI	Х			Х		Х			Х			2	Х							Х						
University of Portsmouth, Uk	Х											Х						Х								/
SmartChair—University of Pennsylvania, U	Х	Х		Х		Х									Х	Х	Х	Х			Х	Х			Х	
SPAM—AT Sciences, US	X X				Х	X										Х										/
SWCS—AT Sciences, US	X X				Х											Х										
TAO—Applied AI Systems, Inc., Canad	X			Х	Х					Х			Х		X*	Х	Х	X								/
TAO-2	Х			Х	Х					Х		2	Х		$X^*$	Х	Х	$X^*$								
TetraNauta—University of Seville, Spain	X X			Х	Х						Х			Х	Х											/
TinMan—KIPR, USA	X X				Х	Х		Х			Х				Х	Х										
VAHM—Universitie de Metz, France (modified wheelchair	Х					Х				Х	Х				Х	Х	Х									/
VAHM (robot base)	X X				Х	Х				Х	Х			Х	Х	Х	Х									
Voice-cum-Auto Steer Wheelchair-CEERI, Indi	Х					ХУ	<u> </u>				Х				Х								Х			/
WAD Project—Bochum University, German	Х					Х									Х	Х										
Watson—NAIST, Japar		Х		X							Х													_		/
Wheelesely-Massachusetts Institute of Technology, U	X X			Х	Х	Х										Х	Х									

\* unclear whether feature was implemented

<sup>1</sup> unclear whether small vested with multiple makes/models of wheelchairs system that was designed to be compatible with multiple makes/models of wheelchairs was actually tested with multiple makes/models of wheelchair system, CEERI = Central Electronics Engineering Research Institute, CHARHM = Chaise Roulante Autonome pour Handicapé Moteur, COACH = Computer Assisted Wheelchair for Handicaped People, CWA = Collaborative Wheelchair Assistant, FH = Fachhochschule, FORT NLPR = National Laboratory of Pattern Recognition, OMNI = Office Wheelchair with High Manouverability and Navigational Intelligence, RIAKP = Research Institute for Applied Knowledge Processing, SPAM = Smart Wheelchair Component System, TIDE = Technology Initiative for Disabled and Elderly, TRAC = Texas Robotics and Automation Center, VAHM = Véhicule Autonom

				Input					Factor		Cont	trol		Eva	luation	
Automatic Mode Selection	Manual Mode Selection	Voice EOG	Force-Feedback Joystick	Face/Head Orientation	Gesture Recognition	Deictic EMG	Modified Robot Base	Modified Power Wheelchair	<sup>r</sup> Add-On Unit (	Omnidirectional	Subsumption Net	ural work Multilevel	None Unmanned Able-bodied			l Disabled
					-				$\mathbf{X}^{\dagger}$						Х	
								X					**	Х		
								X X					Х			
								X					Х			
								X					X			
									$\mathbf{X}^{\dagger}$					Х	Х	
									$\mathbf{X}^{\dagger}$						Х	Х
							Х							Х		
								Х								
X				X	Х			X							X	**
Х				Х				Х					V		Х	Х
		$X^*$	Х					Х					Х			Х
	Х	Λ	Λ					X				Х			Х	
	X						Х				Х	X	Х			
		Х		Х		Х		Х							Х	
Х		Х						Х							Х	
	Х	Х						Х			Х	Х				
								Х		Х		Х			Х	Х
								X					**		Х	
	v	Х				Х		X X			V		Х		х	
	X X	Λ						X			Х				X	
Х	А							X				Х		Х	Λ	
								X						X		
Х	Х							Х				Х			Х	
		Х						Х							Х	
	Х	X X		Х		X*			$\mathbf{X}^{\dagger}$						Х	
								Х							Х	
	Х			Х				Х							Х	Х
								Х								v
								X				x			Х	Х
												••			X	
			Х					Х		Х					X	
								Х							Х	
								Х				Х		Х		
									$\mathbf{X}^{\dagger}$					Х	Х	
	Х					Х		Х	*			Х			Х	
									X <sup>†</sup>					N/		Х
Х									X X <sup>†</sup>		Х			Х	х	
X									л Х <sup>†</sup>		X				X	Х
		Х							$\begin{array}{c} X^{\dagger} \\ X^{\dagger} \\ X \end{array}$						X X	
	Х								X						X	
	Х							Х			Х	Х		Х		
	Х						Х				Х	Х			Х	Х
		Х						Х						_	_	
								X					Х			
Х		Х		Х				X X							X X	
Λ		А						Λ							Λ	

H = Foundation for Research and Technology, IBM = International Business Machines, INCH = Intelligent Wheelchair, INRO = Intelligenter Rollstuhl, KIPR = KISS Institute for Practical Robotics, MAid = Mobility Aid for elderly and disabled people, NAIST = NARA Institute of Science pour Handicapé Moteur, WAD = Wheelchair Attrac