

P-E. HSU, C. GEISER, K-W. CHANG, J-M. LU, Y-L. HSU. **Development of an intelligent robotic wheelchair.** *Gerontechnology* 2012;11(2):340; doi:10.4017/gt.2012.11.02.250.00 **Purpose** Mobility is one of the fundamental requirements for quality of life for older adults. Observing older adults with low mobility living in a nursing home or in a home environment, most of their daily time is spent in a wheelchair. Older adults who cannot move a manual wheelchair themselves, have to wait endlessly, leading to a loss of vitality. Using an electrical wheelchair is one option. However, operating an electrical wheelchair is often difficult¹. This paper describes the development of an intelligent robotic wheelchair (*iRW*) which integrates advanced robotic and telehealth solutions. In addition to providing mobility assistance, the *iRW* also attempts to integrate and satisfy the needs of everyday living, healthcare, and social participation. **Method** The *iRW* is composed of a moving vehicle, a sensing/control module, and an information/communication module to provide mobility aids and to support everyday living and healthcare. Equipped with 4 Mecanum wheels, the user can freely control the *iRW* in all directions, including moving sideways. In addition to manual control, an automated guided vehicle (AGV) indoor navigation system based on quick response code (QR code) can guide the *iRW* moving from A to B automatically. Moreover, the multiple degrees-of-freedom seat adjustment mechanism based on Stewart platform² and the ergonomically designed seat enable relaxed sitting in preferred postures, as well as lifting and transfer assistance. Equipped with soft pressure sensors, the seat also provides automatic pressure relief function by timely adjusting the seat mechanism. Moreover, the telehealth system in the form of a digital photo frame running on a tablet PC serves as the platform of health care management and as the information channel between the wheelchair user and his family or caregivers³. **Results & Discussion** To prepare a field test for the *iRW* confirming the usability and praxis capability, 20 healthy adults participated in a laboratory evaluation. This evaluation was based on several typical tasks of everyday living in a wheelchair, in order to compare the differences in usability between a manual wheelchair and the *iRW*. In the user-satisfaction questionnaire, participants rated all functions, including operation interface, maneuverability, seat adjustment, etc., from 5 (totally satisfied) to 1 (totally dissatisfied). Operation time of each task was also measured. The results show that the time of exploration using the *iRW* for each task was similar or longer to a conventional wheelchair. But user-satisfaction on mobility assistance and seat adjustment was rated higher for the functions provided by the *iRW*. The peak seating pressure of the *iRW*, which has versatile seat adjustment capability, was only half of that of the manual wheelchair. According to the results of the laboratory evaluation, the *iRW* has a good potential to help the older adults interact with the home environment more effectively and actively, while improving the quality of life.

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Figure 1. The prototype of the *iRW*