A social robot to promote intergenerational interaction in community service during coronavirus (COVID-19) pandemic

Y. J. Mao, D. K. H. Lai, A. K. Y. Cheung, A. Y. C. Tam, D. S. K Cheung, J. C. W. Cheung

Purpose Public facilities, including schools and restaurants have been restricted under coercive measures during COVID-19. People were forced to stay at home or residential facilities and the opportunities of face-to-face gathering were minimal. Adults and young people have switched to the online medium for their work and study. However, many older adults could not take advantage of the Internet or online resources because they lacked the skill and resources, leading to loneliness and social isolation. There was an association between depression and stay-home measures, which also impacted the physical functioning of older adults (Kwan et al., 2020). On the other hand, universities hosted service-learning education to help those in need. In addition, students can apply their knowledge learnt from the university onto the society or community, in which the gerontechnology course is one of the good examples. Recently, gerontechnology has been widely embraced by caregivers to promote the well-being of elderly, including the use of smartphone apps, fall detector, anti-wandering sensor and companion robot (Cheung et al, 2010, 2021, 2020). This study aimed to develop a social robot to promote intergenerational interaction that alleviates the loneliness among elderly. **Method** As shown in Figure 1, a social robot was developed using the Raspberry Pi 4 single board computer (Raspberry Pi Foundation, Cambridge UK), a 7-inch LCD display, a 16-channel 12-bit PWM/Servo Driver - I2C interface PCA9685 module (AdaFruit Industries, NYC, USA), and 6 compact servo motors. The LCD was used as the face of the robot. An in-house design robot housing and internal structure were fabricated using 3D printed acrylonitrile butadiene styrene (ABS). The customized software was coded using Python running on Raspbian OS. Three games were designed, including guessing traditional Chinese food, mathematics multiple operation, and daily news quiz. The setup also includes robot cover, backdrop, pair of Bluetooth speakers, and projector (Figure 1). Question, narrative, and game flow were generated and controlled by the program with native voice support. The question and photo were shown on the protection screen during the game. The "emotion response" of the robot appeared by means of the facial expression on LCD display and arms motion. The robot voice was controlled by the program and an operator to accommodate different service recipients. The students developed and operated the robot to serve the older adults in a community center in the service learning course (gerontechnology) during COVID-19 in compliance with the pandemic control measures. **Results and Discussion** The community center arranged 2 days for service and robotic team with 6 students interacted with approximate 60 elderlies per visit. The older adults and students demonstrated good interactions modulated by the robot and game. The center staff reported that the older adults had an improved mood and psychosocial change after the event. Future study may consider enhance the voice recognition function, motor feedback system and question bank management system.

References

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Figure 1. Social robot with full setup (Left), Project screen sample output with the setup (Right)