Home environment models for comfortable and independent living of people with disabilities

Toward a comfortable home environment designed by people with disabilities themselves

We have developed a system design technology that allows people with disabilities to combine various disability aids and use them in an integrated manner. Home environment models to address the needs of individuals with disabilities have also been proposed and demonstrated. In the system, input and output devices that use different control methods are networked by using a common network platform technology for robot modules, "RT (Robot Technology) Middleware". This allows devices to be easily added to or removed from the network and enables cooperation of the devices on the network; thereby, it allows the user to combine devices according to his/her needs. The system is equipped with high-performance interfaces for equipment control, namely a stereovision-based, fast-response gesture interface that can be customized according to the level of mobility of a person with disabilities and a speech-recognition interface that is robust to noise in the home environment and can recognize unclear speech. In addition, active casters for easy movement of home equipment are installed in the home environment to provide physical assistance.

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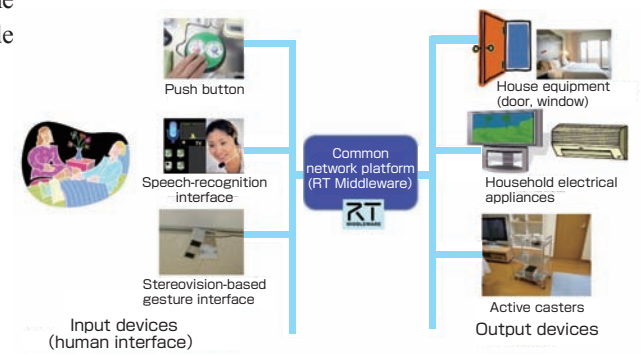

Networking of various disability aids via common network platform (RT Middleware)

Single-walled carbon nanotubes as capacitor electrodes operable at 4 V

Leading the way to development of small, light, and high-performance capacitors

We have developed a super capacitor electrode using as-grown single-walled carbon nanotubes (SWCNTs), synthesized by water-assisted chemical vapor deposition. The aligned SWCNT ensembles have better electronic and ionic conductivities compared to activated carbon (AC) due to their cohesion, crystallinity, and absence of filling/binder material. Specifically by fabricating electrodes purely from SWCNTs, with high carbon purity (99.98 %), a higher voltage range of 4 V is achieved compared to only 3 V for AC. Additionally these SWCNT electrodes maintain durability (3.6 % decline over 1000 cycles at 4 V).

Furthermore, due to their high electronic conductivity, the SWCNT electrodes can operate without full coverage by metal current-collectors, thus enabling significant device weight reduction. The performance of a SWCNT device without current-collectors is estimated for an energy density at 17 Wh/kg and for a maximum power density rating at 24 kW/kg.

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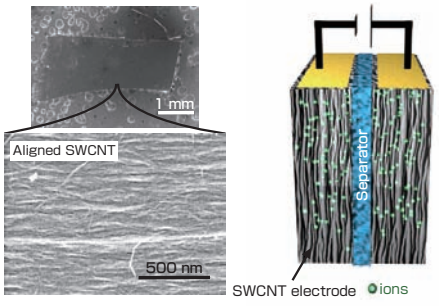

SEM image of SWCNT electrode (left) and cell assembly without metal current-collectors (right)