Movement and Meaning Middleware (M+M)
Turning dance into data

Movement is an essential part of human communication; we prefer face-to-face interaction because we can see another person's reaction, observe their gestures, and read their body language. Computers, which have come far in interpreting written language and audible speech, still can't notice a scowl, interpret a hand wave, or see the poetry in dance. Until now.

Movement and Meaning Middleware (M+M) is a Research Software Platform that gives computers the ability to understand human movement by quantifying it – turning fluid analog movement into a new form of digital data. The software also allows people to use this data to manipulate robots, control game characters and avatars, teach manual skills, critique student dancers, and so on.

Interpreting movement as human

How does it work? M+M relies on a large variety of commonly available technologies – mobile phone accelerometers, motion-capture cameras, game controllers (like Microsoft Kinect and Nintendo Wii), and wearable devices (such as Fitbit) – to measure the numerous locations of a person's body, limbs, head, or hands as they move. M+M merges these sequences of individual locations and creates a digital representation. This representation is fed into other computers where it can be used to mimic human movement or as a benchmark from which to evaluate human movement.

Potential in both arts and science

The analysis of human movement has great potential to help researchers in social, cultural, technical and medical applications – from improving Olympic athletes' performance, through controlling the motion of computer-generated actors, to understanding motor-control diseases like Parkinson's. M+M can contribute to the arts as well through interactive installations like the 2014 "Longing and Forgetting" exhibit in Surrey, BC, where audience members use their mobile devices to control the artwork's characters. It's also a natural technology to support further advancements in telesurgery, where Canada is already a leader.

Collaborative creativity

M+M is the result of a collaboration between the School of Interactive Arts + Technology at Simon Fraser University, Credo Interactive, a company developing animation and choreographic software for human movement, and H+ Technologies, creators of customizable intuitive gesture-based systems and holographic displays.

A number of the M+M components are now available through the CANARIE Software Registry: the M+M Platform, sensor input software, a real-time movement database, and connectivity software that allows M+M to interact with other software systems.

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Technical Details

Platform: M+M: Movement + Meaning Middleware

Description	• Acts as an intermediary between subsystems that provide sensor data, such as accelerometers and motion capture cameras, and actuators such as projectors and sound systems • Provides mechanisms for reporting and interrogating the protocols used by the sensors and actuators, as well as a standard architecture for creating services.
Creator(s)	Simon Fraser University
Collaborator(s)	Credo Interactive, H+ Technology, Emily Carr University
Research Subject	Social Sciences and Humanities
Managed Version[i]	No
Self-hosted Version[ii]	Yes
Cloud Support	No
Host OS	Windows and Mac OSX
Licence	BSD
Details	canarie.ca/software/mm-en

Contributed Services:

	M+M 3rd Party Platform Integration	M+M Movement Database	M+M Sensors	M+M Utilities
Description	Interconnection or adaptation software that joins an M+M system with other applications, such as openFrameworks, Max/MSP, Processing, and iDanceforms.	Applications that utilize the movement database and operate in an M+M system, but that are not part of the core M+M system.	Applications that utilize one or more sensors and operate in an M+M system, but that are not part of the core M+M system.	Utility programs for M+M that provide access to the processes that are running in an M+M installation.
Category	Data Manipulation	Data Storage and Retrieval	Sensor Management/ Data Acquisition	Sensor Management/ Data Acquisition
Research Subject	Software and Development	Database Management	Multimedia systems and networks	Software and development
Managed Version[i]	No	No	No	No
Self-deployed Version[ii]	Yes	Yes	Yes	Yes
Cloud Support	No	No	No	No
Host OS	Windows and MAC OSX	Windows and Mac OSX	Windows and Mac OSX	Windows and Mac OSX
Licence	BSD	BSD	BSD	BSD
Details	canarie.ca/software/ mmintegration	canarie.ca/software/ mmdatabase	canarie.ca/software/ mmsensors	canarie.ca/software/ mmutilities

[i] Managed version: Creators host a live instance of the software on their infrastructure, available for use by others

[ii] Self-deployed version: Users host a private instance of the software on their own infrastructure