

Canadian University Music Society Conference, London, Ontario

Challenging 300 Years of Piano Teaching Practices with 21st Century Technology: New Teaching and Research Tools in Piano Pedagogy

While new technologies have penetrated all spheres of educational practice, piano pedagogy has been very slow to incorporate these new tools. For many years, piano teaching has remained an intuitive field with very little scientific research and data to support its teaching practices. But the practice of piano teaching and the research activities in piano pedagogy could be greatly enhanced by many new developments in information technology and engineering. Such an undertaking, however, extends far beyond the traditional boundaries of university music departments and requires the participation of a multidisciplinary team of researchers whose joint efforts could greatly facilitate the study of piano teaching and piano learning. Here is a list of the topics to be discussed:

- Development of new computer vision technologies for monitoring and analyzing the complex physical movements involved in piano playing
- Video- and broadband-mediated learning in piano pedagogy
- Analysis with infrared thermography of the impact of piano practices on the body regions that are under stress
- High-speed quantitative measures of key inputs, and indirect control of these inputs via varied piano touch
- Exploration of the benefits to piano pedagogy from a research and development program of music technologies for people with disabilities

Video- and Broadband-mediated Learning in Piano Pedagogy

Topic: Presentation of new teaching processes for innovative music learning and music teaching

Speaker: Gilles Comeau, Director of the multidisciplinary Piano Pedagogy Research Laboratory

Abstract: This session will provide in-depth insight into next-generation distance-education and video-mediated learning. Case studies and video examples will demonstrate state-of-the-art pedagogy and technology, including broadband video conferencing and the use of video. Examples include distance teaching to remote communities, master-classes with overseas participants, video capture of a piano lesson from multiple angles, instant replay and professional development for teachers. Case studies and video clips of work in progress demonstrate strengths, weaknesses, and potential for improved learning outcomes.

Development of new computer vision technologies for the monitoring and analysis of complex physical movements involved in piano playing

Topic: New trends in computer vision and artificial intelligence to assist in piano teaching and training

Speaker: Pierre Payeur, Co-founder of the Vision, Imaging, Video and Autonomous Systems Research Laboratory

Abstract: Ways of monitoring the movements executed by piano players have been explored for more than a century. Early investigators used the technologies of their times, like fingerprints and passive articulated mechanisms, to find ways of improving piano-playing techniques through a close analysis of touch mechanisms and forces. Now, in the age of computers and electronic sensors, numerous new technologies are available to push this investigation a step further. Computer vision, image processing and artificial intelligence have now evolved to the point where they can contribute to the development of professional pianists. Modern sensing technologies are being investigated to quantitatively monitor pianists' movements, which can then be analyzed to identify typical postures and gestures that can help improve pianists' resistance and performance. Classical techniques of image processing are presented with applications and examples on piano performance.

Quantitative Measures of Key Inputs and Their Pedagogical Application in Teaching Piano Technique

Topic: Presentation of high-speed quantitative measures of key inputs and indirect control of these via varied piano touch

Speaker: Stephen Birkett, Director, Waterloo Piano Systems Group, Systems Design Engineering

Abstract: A highly trained pianist may have such a characteristically distinct tone that the sound of their playing is identifiable—in effect, an aural signature. Busoni, for instance, was known for his massive, resonant tone quality; Horowitz's tone might be said to have had a crystalline depth to it, and so on. While these descriptions cannot be objectively evaluated, and in any case are best viewed in an holistic musical context, anecdotal evidence does suggest that tone quality, not simply volume of sound, can be influenced by a pianist. Recent research has suggested physical means whereby varied tone quality might be obtainable from a hammer action keyboard. This ultimately demands the pianist provide a specific, highly complex, yet predictable, mechanical input to the key. Although anatomical configuration of the fingers and hands plays some role in how this is accomplished, it is primarily through the application of physical posture and the gestures inherent in all schools of piano technique that the pianist can indirectly achieve the required control at the key front. Quantitative measurement of these inputs in various musical contexts can be an aid to understanding the interactions between touch and tone, and serves a useful pedagogical function to assist in targeting the acquisition of technical skill.

Collaboration Between Music and Engineering Researchers: A Winning Proposition

Topic: Presentation on thermography and some early results in piano students at the University of Ottawa's Department of Music

Authors: Monique Frize, Christophe Herry, Rafik Goubran

Speakers: Monique Frize, co-founder of the Medical Information Technologies Research Group; Christophy Herry, PhD candidate in Systems and Computer Engineering

Abstract: The presentation will describe the benefits of using thermography to examine the hands, arms and shoulders of students playing the piano. Comparing the images recorded prior to play, mid-way through a lesson, and again afterwards would provide information on the thermal patterns related to the physical aspects of this activity. The goal is to examine whether thermography technology can help to identify body and hand movements that may lead to neuromuscular damage.

A missing link?: What new piano pedagogy technology and music technology for people with disabilities can learn from each other

Topic: How a research and development program of music technologies for people with disabilities can benefit new piano pedagogy and technology

Speaker: Roger Knox, music research coordinator at Bloorview MacMillan Children's Centre, Toronto

Abstract: With the advent of microcomputers, the Musical Instrument Digital Interface standard, the Internet, artificial intelligence, and sophisticated sensor technologies, including computer vision, music technology has enabled an explosion of new opportunities for musical participation. Within its extensive rehabilitation engineering research program, Bloorview MacMillan Children's Centre has been a leader in the adapted music field for fifteen years. A synthesis of technological developments, new research findings, and service experience will provide a springboard for discussion on linking music technology research and development for people with disabilities with new piano pedagogy and technology. A new parametric model, illustrated with videotaped examples, for representing musical and non-musical components in this field will be presented.