Report on VIPRG 2007

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I. INTRODUCTION

Virtual Instructor Pilot Research Group (VIPRG) 2007 is the 1st International Workshop on Virtual Instructors that provides a forum for researchers to share their latest research on virtual instructors towards the development and improvement of an International virtual instructor architecture standard. VIPRG 2007 is held May 21st and May 22nd in 2007 on the campuses of Georgetown University, USA and includes plenary invited talks, workshops, tutorials, paper presentation tracks and panel discussions

Virtual instructors are intelligent, self-adaptive pedagogical agents also described as intelligent tutors. Considering the increase in the aging population and the considerable complexity in daily routines, virtual instructors will be important in the training of all age ranges. These virtual instructors have the capability of improving human learning performance by delivering personalized instruction leveraging multiple modes in mixed reality environments.

The IEEE Virtual Instructor Pilot Research Group (VIPRG) was formed to address the architectural and conceptual issues of realizing the goals of a virtual instructor.

The international noted author and "futurist", Ray Kurzweil stated that by year 2010, virtual humans will pass the Turing Test. In his prediction, people will not mistake virtual humans for real ones, but will interact naturally with them as information assistants, virtual coaches, virtual sales clerks, virtual teachers, entertainers, and virtual instructors. Perhaps, one of the most important applications of virtual human technology will be in the teaching domain.

Because virtual teachers may be realistically designed to operate separately from school system politics and policies, it would be difficult to attribute alternative motives to an anthropomorphic character. Additionally, a well designed virtual instructor will provide instruction with the main goal of improving the knowledge of the learner. With this innovative model of virtual instructor directed learning, real-humans will be taught at their own pace by their personal virtual human and personalized instruction based on empirically tested instructional techniques (i.e., pedagogy) for the purpose of improving human learning performance.

A true virtual instructor should provide a personalized human learning experience by applying empirically evaluated and tested instructional techniques for improving human learning. These instructional techniques, combining the art and science of teaching (i.e., pedagogy), may be exemplified by anthropomorphic entities ranging from three dimensional (3D) animated characters to human interacting robotic systems that intelligently consider multiple variables for improving and potentially accelerating the human learning process.

These variables may include, but not limited to learning styles, human emotion, culture, gender, disability, or pedagogical techniques. Additionally, virtual instructors should be designed to behave autonomously in mixed reality (e.g., real-world, virtual reality, augmented reality, augmented virtuality, etc.) environments, respond to human verbal/non-verbal input across distributed and wireless computer networks, and naturally interact with human learners using context-aware intelligence across cultures.

By combining state of the art technologies and instructional/learning techniques, virtual instructor systems may improve and accelerate human learning performance anytime, anywhere, and at any pace. However, in order for virtual instructor systems to improve and accelerate human learning performance, they must combine instructional skills of "master" instructors that possess expertise in specific academic/knowledge domains.

Additionally, they must exceed human pedagogical capabilities required to effectively guide learners through complex concepts/task and clarify misunderstanding, while at the same time, become intimately involved in understanding the learner and the knowledge being learned. What results are computational challenges for all virtual instructor developers that require interdisciplinary expertise in areas such as cognitive science, sociology, computer software engineering, computational humanities, educational technology, artificial intelligence, 3D computer graphics, linguistics, interactive display technologies, and robotic systems.

In 2002, approximately 30 international researchers from multiple disciplines convened at the University of Southern California to begin to bridge the gap between virtual human knowledge and tools required to build them. Their goal was to define a modular architecture and interface standards that will allow researchers in this area to reuse each other's work. Researchers concluded that this may only be achieved through a close multidisciplinary collaboration from a variety of areas. To date, there has not been the same level of national nor international collaboration for defining architectural standards for developing "embodied" virtual instructor systems. Other researchers have investigated the components to build more human interactive virtual humans or agents.

Because of technological advancements in artificial intelligent, Internet, mobile technology, virtual reality, GPS, and other emerging technology, virtual instructors may achieve

Ray Kurzweil's vision of not only a virtual human passing the turing test, but a virtual instructor providing effective instruction by 2010.

Dr. Jayfus T. Doswell directs the Juxtopia Group, Inc., a non profit organization that conducts empirical research on interactive learning technology for improving the learning proficiency of underserved and disadvantaged populations. Dr. Doswell is also the co-director of the IEEE virtual instructor pilot research group (VIPRG) www.viprg.org, a 30 member international research group for developing an architecture standard for building virtual instructors for mixed reality learning environments. He earned a BS from Oberlin College (where he developed the 1st interactive instructional system to teach Embryonic Biology), a Masters of Systems and Computer Science from Howard University (where he investigated an interactive virtual reality learning environment to teach basic numerical concepts), and a Ph.D. in Information Technology from George Mason University (where he focused on a system/software architecture for developing virtual instructor systems). He has spent the last seven years researching, designing, and developing virtual instructors.

Dr. M. Brian Blake is the Department Chair and the Director of Graduate Studies in the Department of Computer Science at Georgetown University. Dr. Blake conducts applied research in the development of intelligent agent approaches for the sharing of information and capabilities across organizational boundaries. Such systems require approaches that enhance agent-to-human interfaces. He has published over 80 journal articles and refereed conference papers in the areas of intelligent agents and workflow, service-oriented computing and architectures, component-based software engineering, distributed data management, and software engineering education. He received a Bachelor of Electrical Engineering from Georgia Institute of Technology and a PhD in Information and Software Engineering from George Mason University, Fairfax, Virginia.

Dr. Juan E. Gilbert is the T-SYS Distinguished Associate Professor in the Computer Science and Software Engineering Department at Auburn University where he directs the Human Centered Computing Lab. Dr. Gilbert has research projects in advanced learning technologies, spoken language systems and data mining. He earned his B.S. degree in Systems Analysis from Miami University, his M. S. and Ph. D. in computer science from the University of Cincinnati. Researchers interested in joining the IEEE VIPRG may contact Dr. Doswell jdoswell@ juxtopia.org or Dr. Blake mb7@georgetown.edu.