Interactive Games & Media Within the B. Thomas Golisano College of Computing & Information Sciences: A Whitepaper

Prepared by the Faculty of Interactive Games & Media
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Introduction

Several years ago, RIT established the B. Thomas Golisano College of Computing and Information Sciences as a world-class academic unit to advance the study of the computing disciplines. The college has excelled in several ways since its establishment, by assembling a diverse faculty, recruiting and retaining an outstanding student body, establishing and maintaining world-class programs in a variety of disciplines, and capitalizing on the diversity of talent found throughout the people that comprise GCCIS at all levels. Furthermore, the facilities of the college are completely state-of-the-art and the envy of peer institutions around the world.

GCCIS stands as an institution charged with "enabling and forging innovation" – and it has done just that. GCCIS has produced a plethora of engaging and energetic degree programs, graduated students throughout the world, and provided a progressive and top-quality education to undergraduate and graduate students. Faculty and researchers have patented a variety of new technologies, and the college has grown every year both in terms of the number and quality of publications produced. GCCIS enjoys a well-earned reputation as an excellent institution within the academic community.

That said, every organization moves forward and strives to ascend to the next level. Several problems currently face the college, some of which are dictated by the national trends surrounding the study of computing: primarily, a decline in the overall interest in our field relative to the national academic scene. The latest strategic plan of the college [1] identified several key goals, and many of them relate to issues of visibility, enrollment, and student success.

Another area of concern facing the college is the role of research within the college, particularly as it relates to the university's goals in this area. More emphasis and support is needed to support funded research, more avenues of funding and support are necessary relative to current successes, and aid to faculty is paramount as they continue on a transition process, evolving from a primarily teaching institution to one that incorporates research and development as a part of its core mission.

To address RIT's successes, challenges, and changes, current discussion has begun to center around the notion of re-organizing the college to better suit administrative and academic needs. **Of primary concern is to explore ways to better support collaborative work and shared study across the programs, research, and faculty of the college.** As a part of that discussion, the group of faculty that has self-identified as the ***Interactive Games & Media*** group has been asked to prepare this whitepaper to present our vision of GCCIS and how we perceive an IGM unit fitting in and interoperating with the other units within the college. Additionally, this whitepaper attempts to define a "road map" of where we see the academic landscape relative to IGM interests growing over the next five years, and where we believe our programs will be in such a timeframe.

1. A Vision of GCCIS

1.A What is the shared vision of GCCIS?

The Golisano College of Computing & Information Sciences represents one of the premier academic establishments for the study of computing. Specifically, GCCIS brings to the forefront a vast array of viewpoints, methodologies, and areas of study such that students and researchers can draw upon a wide range of expertise

and implementation capability in pursuit of their studies. The college specifically addresses computing from five distinct viewpoints:

A. The study of the formal and theoretical computational sciences
B. The application of engineering principles to software construction
C. A focus on collaborative and secure computing networks and infrastructure
D. An in-depth application of informatics to a wide range of disciplines
E. The exploration of the use of computing as a medium of expression and entertainment.

These differing lines of inquiry also serve as an implementation of the practical aspects of cyber-infrastructure as originally defined by the National Science Foundation, but broadened to encompass a more holistic view of computing as it affects society today, and not only scientific inquiry. Using the notation from the list above, the five lines of inquiry can be distributed across the intradisciplinary areas of knowledge that form the core of the study of cyber-infrastructure [2]:

1. **Interaction** – a view of computing related to the combined action of two or more entities that both affect one another and work together when facilitated by technology. **[A]**[B][C]**[D][E]**
2. **Infrastructure** – a view of computing primarily related to hardware, software construction, communications, and their integration into the best organization of these elements to provide optimal architectural solutions. . **[A][B][C]**[D][E]
3. **Informatics** – a view of computing emphasizing the study of computational/algorithmic techniques applied to the management and understanding of data-intensive problems. [A]**[B][C][D]**[E]

(Approaches of academic inquiry from above are listed [A]-[E]and bolded for emphasis on relationship, the point being that all areas overlap, but relate differently and in different weight to each of the areas based on their own academic focus)

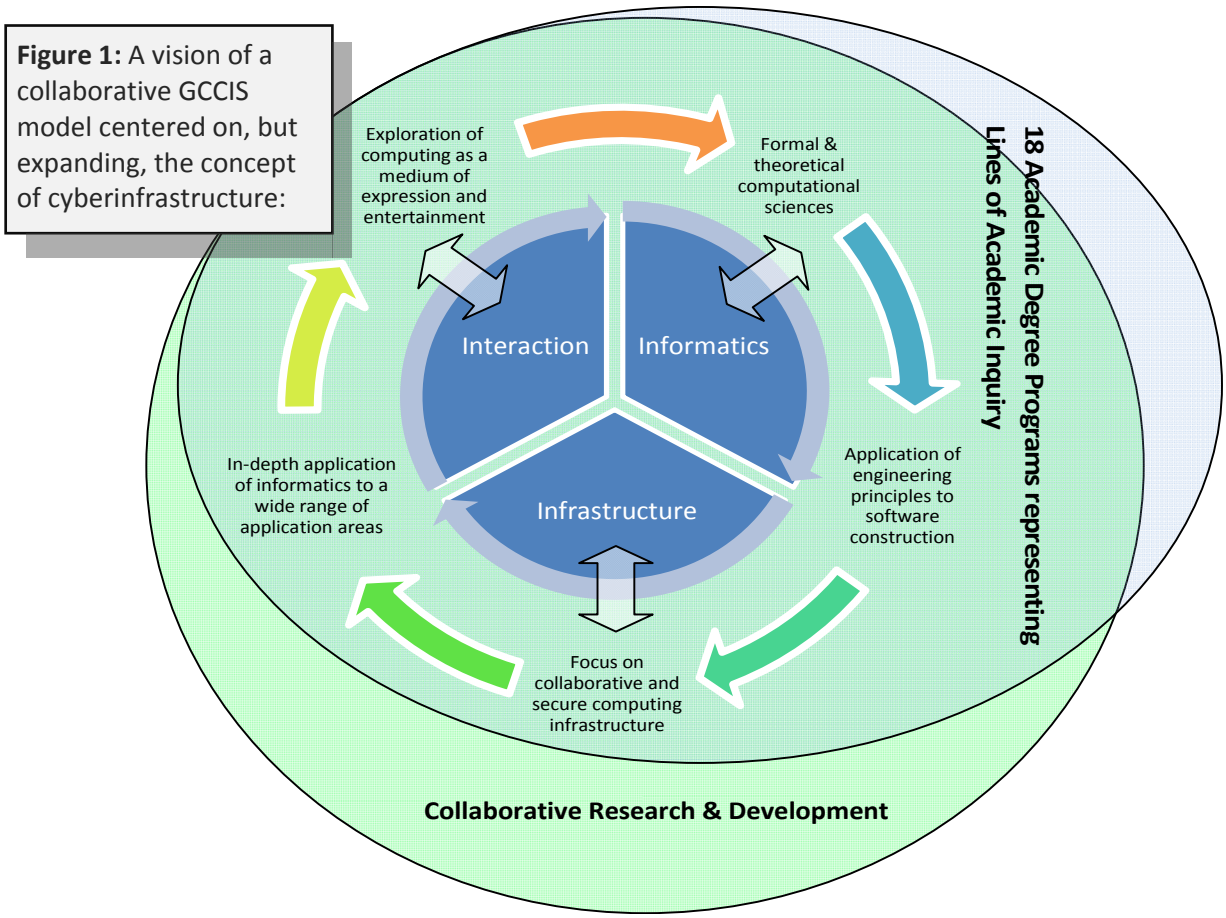

Figure 1: A vision of a collaborative GCCIS model centered on, but expanding, the concept of cyberinfrastructure:

Through this distribution we note that all GCCIS programs incorporate Interaction, Infrastructure, and Informatics, albeit with different emphasis in the various flavors of academic exploration. Thus, the college offers a wide array of degree programs at both the undergraduate and graduate levels that reflect these various foci of inquiry, as well as a doctoral program that seeks to incorporate all of these areas into a holistic view of cyberinfrastructure.

By allowing faculty to pursue these wide-ranging academic pursuits, the college can address a staggering array of different types of problems facing the overall field by exploring its diversity through collaboration.

1.B How does IGM fit within and enhance GCCIS?

IGM forms an important element to the overall make-up of the college. By incorporating the IGM viewpoint into the administrative flow of the college and ensuring that a media-centric analysis is one of the elements expressed throughout the academic discussion, GCCIS makes a clear distinction to recognize and embrace computing not just as a discipline of computation and application, but as a medium that allows for a full range of creativity and expressiveness. This sets GCCIS apart from several other colleges and universities, and draws an inclusive and collaborative distinction that is key to the future of the study of computing.

Broadly speaking, IGM fits within GCCIS in a bi-directional fashion: there are services and collaborations that are driven by entities that seek to better understand computing from a media-centric perspective, and there are services and collaborations that are driven from media-centric computing specialists seeking to better understand other areas of computing and information sciences. This occurs across a field of students, faculty, staff, academic programs, research projects, etc. This 'two-way flow' of interest and collaborative work is critical: the IGM group brings to the table skills and experiences that we feel are of benefit to the rest of GCCIS and RIT – as recently exemplified by the unprecedented interest in our GD&D programs and our proposal for several academic minors in this space. Likewise, it is critical that in any administrative structural changes we retain the ability and wherewithal to partner with other entities within GCCIS (such as our curricular partnerships with Computer Science) and across RIT (such as our work with the College of Business, CIAS, or the Center for Imaging Science).

This focus and clarity with regard to the study of media-centric computing will keep us ahead of the "pack", and on par with other institutions such as Georgia Tech, USC, and CMU that have already made similar decisions about the direction of the study of computing and information sciences. Likewise, it will make clear to the RIT campus at large our focus on creative uses of technology, and will help the college convey to the outside world, that we as a college are more than simply implementers of technology.

IGM operates within and beyond the college in 5 distinct ways:

1. **By offering the existing, and any forthcoming, degree programs that explore the intersection of media design and technological implementation**. The degree programs that fall within the IGM purview are currently the B.Sc. in Game Design & Development, the M.Sc. in Game Design & Development, and the B.Sc. in New Media Interactive Development. Each of these degrees is collaborative in nature, with courses either from other units within GCCIS, or from other colleges within RIT (or both).

2. **By offering minors, elective courses, specialization tracks, and other experiences to students inside and outside of GCCIS**. We currently offer a Minor in Game Design & Development to any student with the equivalent of a programming sequence in GCCISand have proposed a campus-wide minor in Game Design. There are core sequences ,or "concentrations," of courses available to students in Information Technology and Computer Science in both the GD&D and New Media areas. This is a core trend that will continue – we believe that the larger community has an academic interest in what we do at two levels: other units within GCCIS and units outside of GCCIS.

3. **By encouraging our students to pursue minors and academic collaborations in curricula outside of IGM.** Currently students in our programs take courses from Computer Science, Information Technology, NSSA, and CIAS in addition to their core liberal arts, mathematics, and science requirements (not counting free

electives, professional electives, and minors). New collaborations are currently underway with the College of Engineering and the College of Business for additional appropriate electives and co-taught coursework. By encouraging and advising students to look beyond the IGM focus and to view computing through a variety of lenses, we not only produce more well rounded students in our own programs, we foster interdisciplinary thinking and multi-disciplinary work.

4. **By participating in and supporting collaborative research both within IGM and in conjunction and collaboration with GCCIS, and the Institute at large**. The faculty of the IGM group currently have several research projects that are ongoing and see an ever brighter future for additional projects and collaborations. To date, the faculty in this group run and administer several research labs including the Laboratory for Game Design & Development and the Laboratory for Social Computing. They have produced several collaborative projects such as the "Collaboritorium", the Preserving Virtual Worlds project, and collaborative with other colleges (Liberal Arts, CIAS, Science, NTID, and Business) as well as other universities (Hunter, NYU, Maryland, Stanford, UIUC, etc.)

   Moving forward, we expect increased opportunity for research and development as the newly formed IGM group communicates its drive, purpose, and capabilities to funding agencies. Our faculty's scholarly output is already increasing steadily; this trend should accelerate as our academic programs grow and stabilize, and as newly recruited faculty establish their roots within the RIT research sphere. The IGM administrative unit should also be better able to recruit students for a variety of projects, from the Bachelor's level, all the way through to sponsoring doctoral students within the GCCIS Ph.D. program.

   An incomplete listing of some of our current projects and publications can be found at http://games.rit.edu/ under the "Research" tab.

5. **By continuing to be involved with the GCCIS community and the community at large, and expanding this involvement to be more dynamic and responsive.** The IGM group has placed a great deal of emphasis on supporting community activities at both the college and institute levels. These activities include involvement in existing programs such as *RIT Kids on Campus*, *College & Careers*, *Brick City Homecoming*, *RIT NOVA Academy*, etc. as well as additional programs of our own creation, such as our work in local area high schools, *GCCIS GameDay*, *BOCES Game Career Day*, and others. Moving forward, the IGM group will strive to use our own production of media and interactive software to further aid these efforts: the very platforms we create and study should provide additional and highly attractive ways to involve the community in the work of the college.

Through opportunities and procedures such as those described above, the IGM group will continue to provide value and interoperability to both GCCIS, RIT, and the academic community at large. Further opportunities to collaborate will be explored. It The leadership of the IGM group, as well as other groups within the college, must provide incentives for collaborative work wherever possible using every appropriate mechanism.

2. Dynamics and Opportunities

2.A Coordination and Cooperation with National Academic Trends

The creation of an IGM group within the college of computing is in keeping with the forefront of an academic trend in this area. Ironically, when the College of Computing & Information Sciences was first proposed in the charter document authored by Wiley McKinzie, Eydie Lawson, Jeffry Lasky, Michael Lutz, Walter Wolf and Carol Richardson, it identified three competitive class institutions that were taking similar measures and administrative approaches to our formation of the college were identified: the Georgia Institute of Technology, Carnegie Mellon University, and Cornell University [3]. Today, Georgia Tech has established a School of Interactive Computing, similar in many respects to the IGM group, within its College of Computing. Carnegie Mellon has established and is well known for its Entertainment Technology Center, which is not only a research center but functions as a complete administrative entity (and degree-granting institute) reporting directly to the Provost of CMU. Cornell

has recently begun the process of exploring the concept of a media-centric group, and in fact has been reviewing RIT's Game Design & Development programs extensively as a model for curricular development.

Speaking more globally, the document that was prepared by the IGM faculty entitled "Proposal for the Creation of the Department of Interactive Games & Media" that was previously distributed identified a number of competitive class institutions that have now either established administrative entities to better equip the study of computing from a media perspective or are in the process of doing so. Institutions that have taken such measures with great success include our "core competition" worldwide, including the University of Southern California, and the University of Central Florida. A more detailed review of these programs, as well as our larger analysis, is available in Appendix A of the IGM proposal document [18].

2.B Operating at a Competitive Level with Peer Institutions

Editorial Note: This section represents a collection of previous statements from the document previously prepared by the IGM faculty entitled "Proposal for the Creation of the Department of Interactive Games & Media" [18]*, with some editorial changes and additional references. The larger document should be used to place these comments in reference to our complete vision of an IGM group and the rationale for an administrative entity.*

With the continued success of the games and multimedia industries, academia has focused its attention towards this emerging field. As of March 2008, the Game Career Guide lists over 500 schools that offer courses, concentrations, minors, and majors in game design and/or development [4]. The New Media Consortium website lists over 100 member organization programs with related degrees [5]. In this section, we examine competitive institutions that list games and/or new media as a core focus. A more thorough listing of these institutions and their programs can be found in Appendix A.

A great many institutions have initiated "game programs" in recent years. **However, few of these programs are comparable to our Game Design and Development BS and MS.** Most game programs currently come from one of two historical contexts – existing programs in Computer Science, or existing programs in the fine arts. For programs originating in the former, there are countless examples of a traditional CS program with a "course or two tacked on to make it seem games-like"– usually in the 3rd or 4th year of study. Programs originating from the fine arts generally do not exhibit the focus on core technology and systems development that characterize technical programs such as ours. What has not occurred in most of these programs is a complete rework of the curriculum to support the collaborative and content-driven nature of games as identified in this document and exemplified in our programs. Our games and interactive media programs represent collaborative efforts between areas such as information technology, computer science, the fine arts, the liberal arts, and others within the RIT community. We regularly hear from industry contacts and advisory board members that several academic institutions are taking a misguided approach to the study of games, but that our program and those of a few close rivals are "getting it right."

Our successes, and those of a few close peer institutions, have not gone unnoticed. There are now several examples of core programs that are of sufficient quality as to be seen as reasonable competition for our own entering class. Nationally, programs at USC, WPI, RPI, Carnegie Mellon and others have emerged as competitive class institutions. Locally, several schools in the SUNY system are working on their presence in this academic arena, as is a consortium consisting of NYU, Parsons, Tisch School of the Arts, Columbia, and SUNY.

Most programs related to new media are of one of two types: BFAs or MFAs that emphasize the visual design and media creation, or degrees in media studies. **Very few [existing New Media programs] combine a strong technology focus with a solid design background. Even fewer have the cross-disciplinary focus of the New Media Interactive Development degree.** There are, however, competing programs by other names that do offer comparable curricula, and in recent years there has been a shift towards more attention on the intersection of visual computing and media design.

In several of these cases, and particularly in cases where the program approaches one of our size and reputation, administrative units have been defined to make clear the focus on these efforts by the university at large. Georgia

Tech recently reorganized a subset of their faculty in the College of Computing into a "School of Interactive Computing" (that contains no underlying departments and is one of 3 academic units within the college) [6]. The University of Southern California supports its games programs through the establishment of the Interactive Media Division, along with a collection of 4 distinct research centers [7,8,9,10]. NYU, focusing more on the research end of the spectrum than a curricular program, supports its efforts through the NYU Media Research Laboratory [11].The University of Central Florida established the Florida Interactive Entertainment Academy (FIEA), to serve the needs of its programs in this way [12].

By elevating Interactive Games and Media to a recognizable entity within the college, the entire college benefits from the strength of our reputation in this space, and in the collaborative efforts that are likely to be undertaken (outlined in section 1.B above).

2.C Future Academic Trends for IGM

There are several issues facing IGM in both the near future and a bit farther out. First and foremost, we are still at a formative stage with our degree programs. While these programs are, we feel, already proven to be successful, there is still a great deal of work to be done. We strive to anticipate new directions and continue to evaluate the trends. Moving forward, there are opportunities for more curricula, more collaboration, and more research than ever before. Media-centered computing is exploding both internationally and here on the RIT campus!

What follows are brief descriptions of several key areas for IGM development and presence for the next few years:

2.C.1 Casual Games

Casual games represent an immediate strategic growth area for the IGM faculty. While our GD&D program is well established in the study of the more traditional commercial games sector, our work in New Media has been transitioning into the study of casual play experiences. The GD&D programs have also mapped out a significant interest in casual games, portal systems, and design constraints for casual play, and thus the study of casual games represent a very valuable intersection point between our existing programs. This field is also one of the fastest growing areas of the overall commercial games sector [13].

This area is also of significant interest because of the ease with which these titles can be created relative to their larger, more intricate counterparts – typically involving a development team ranging from 3-20 people as opposed to the hundreds per title on the largest commercial ventures. This "ease" of development (although to be fair, nothing about casual games is "easy" – as noted in our involvement in the IGDA Report on Casual Games in 2005 and 2006 [14][15]) allows for more rapid iteration of title production, and the delivery mechanisms facilitate delivery of these games on a wider variety of platforms and media. The IGM group sees significant growth in using casual games and play experiences to express an increasingly wider range of messages across a variety of platforms – both in collaboration with the wider RIT community and to the general public.

2.C.2 Serious Games

In addition to exploring the area of casual games and shorter, focused play experiences, the faculty also anticipate a significant growth opportunity in so-called "Serious Games", or the use of games for non-entertainment purposes. This includes games for education, including (but not limited to) the STEM disciplines, and over the next few years we will be heavily involved in a major research effort involving several institutions in the NY area in this regard. Likewise, our work in using games for our own educational purposes will continue through the RAPT program, our work in *Kids on Campus*, *College & Careers*, and other such programs.

Additionally, we are exploring the use of games in relation to the medical community, both in partnership with colleagues in the IT Department, as well as through partners in the RIT College of Science, the University of Rochester, and Cornell University (working with *The Autism Collaborative*). There seems to be a great deal of synergy in using games for a variety of purposes in health education as well as patient care.

There are now emerging programs at the highest levels that combine the ideas of education, health, simulation, and other related areas into a holistic approach of using “serious games” as a powerful medium for social change, as noted by recent programs from the MacArthur Foundation [16], as well as in more generalized educational topics as exemplified by programs from the Sloan Foundation [17].

We are also heavily involved in the use of games for the purposes of military simulation and intelligence analysis. Current projects include the use of game technologies to aid in the analysis of sensor data obtained by the RIT Center for Imaging Science, as well as faculty involvement in several Game AI projects with the United States Air Force and grants from private military contracts through SBIR and STTIR programs.

2.C.3 Rich Internet Application Development

Just as the field of casual and serious games are taking off, it is interesting to note that the delivery platforms for several of these types of endeavors form the core of most Rich Internet Applications (RIAs). The development of these media-intensive, dynamic, and reactive systems is similar whether or not they are eventually used solely for entertainment, or for other purposes such as simulation, communications, or social gatherings in a variety of contexts. The underlying technology of these systems have their roots in several disparate areas within GCCIS and are applied in a media-centric way by practitioners that often walk the line between technologist and artist.

In addition to the rapid growth and inclusion of casual games within all of the existing programs in the IGM sphere, the IGM group has already begun to develop additional materials and projects that incorporate the study of RIA production within its curricula, most notably within the New Media Interactive Development program, as well as via offerings available to a variety of majors across campus, including sister programs in New Media Design and New Media Publishing.

2.C.4 Integrated Services and Multi-Device Delivery

Interestingly, RIAs bring to the forefront an issue of increasing importance to all of the work undertaken by the IGM group – the concept of platform. The traditional methodologies of media delivery are breaking down – the use of disc distribution is plummeting, and even in areas where it is revived, it is infinitely more complex (e.g., BlueRay and MPEG encoding standards). But more frequently, some content stitches together presence, media, and story across a staggering array of platforms and devices: games that exist simultaneously and concurrently on game consoles, PCs, and hand-held devices is but one type of example. This omnipresent set of devices changes not only how we work, but how we play, the way we communicate, and the way in which we situate ourselves socially within the world.

From a media-centric viewpoint, the availability of the raw delivery power of these platforms is staggering. But, their potential is incredibly underutilized today. New platforms are saddled with poor quality “re-implementations” of hit titles of yesteryear rather than pushing the boundary of new paradigms and innovative solutions for the next generation of devices and networks. The existing commercial industry suffers from “sequel-itus" – driven in part by the risk-averse nature of the production cycle and in part by a recent transitionary period in which the standards that defined the platforms were in a high degree of flux.

But it is clear that the general trend over the next few years is to diversify media delivery over a variety of devices, to integrate delivery across several different media and capability sets, and to offer, on demand, the experiences and interaction that is required by computing in the next digital renaissance. We strongly believe that IGM has an important role to play in this phase of growth and change for the larger field, that the viewpoints of fields such as New Media and/or Game Design hold particular resonance with these ideals, and that, ultimately, some of the technologies that have been developed for media systems in this arena will find themselves adopted for much wider goals and implementation paradigms.

2.C.5 Social Software, Game Studies

Interest in web services and communications platforms that attempt to use "game-like" environments, social interaction models, and technologies to produce new and innovative communication models for communities and users beyond traditional corporate channels has exploded. For example, Professor Lawley recently used a memory-recall and recognition game of her own design to augment the internship and workflow integration processes at Microsoft Research, to rave review. This type of incorporation of games, game technologies, rich media, and collaborative software is critical to companies the world over - --every day, companies realize that social networks, such as Facebook, mySpace, and SecondLife, are a key to communicating in the next generation of online identity.But the study of these environments and their relationship to games, media, and culture sorely lacks support, particularly from a forward-looking development and implementation context. Partnering with other groups on campus through entities such as the Laboratory for Social Computing and the Laboratory for Technological Literacy, projects and curriculum in this area will continue to emerge from the IGM group.

2.C.6 Entrepreneurship and Business Partnerships

There is now significant interest amongst both students and faculty in the IGM group to collaborate and explore cross-disciplinary connections between IGM and the group in the College of Business focused on digital entrepreneurship. These activities go hand-in-hand: founding and running a games studio, a RIA applications business, or building serious games for the government all require the "spark" of entrepreneurship in addition to technology. To date, there have been several students that have used electives and concentrations to cut across our curricula, IGM faculty have worked directly with COB faculty through the Laboratory for Social Computing on several projects, and Professor Phelps, Director of Game Design & Development, sits on the advisory board of the Albert J. Simone Center for Innovation and Entrepreneurship. Recently, a GD&D masters student team incorporated their first company in the RIT Venture Creations incubator. There is a great deal of opportunity in this area for increased future collaboration, including coursework, research, and joint development.

2.C.6 Physical Computing & Alternative Interface Technologies

Finally, we note that just as the previously discussed concept of "platform" is currently experiencing a high degree of rapid change and invention, so too is the concept of "interface" . Recent challenges to the status-quo, such as the Wiimote, the iPhone touchscreen, the Microsoft Surface tabletop computer, and the Guitar Hero controller, all illustrate in rapid succession the notion that the proverbial '"mouse and keyboard'" are not the only way to interact with media technology. IGM faculty are currently involved with a wide variety of technologies in this space, including partnering with NYU on Wiimote functionality for non-Nintendo platforms, the exploration of the incorporation of accelerometers from Kionix into a wide array of devices and usage scenarios, and the construction of custom interfaces that completely defy standard conventions, such as the CollaboRITorium.

Likewise, a high-impact growth area for the group is the notion of so-called "physical computing'" or "wearable" computing – the notion that computing technology embedded into a wide variety of devices and systems can be used to interact with systems in ways in which we have only begun to even dream of. Our faculty are working on experimental systems that are being incorporated into interactive performance pieces, live studio synthesis techniques, and other advanced implementations.

Conclusion

This is an amazing time for the field of Interactive Games & Media, as well as for GCCIS and RIT. Internationally, programs in this area are ramping up across the nation and around the world, and in doing so, are recognizing our programs as leaders of the field and pioneers within the educational community. When GCCIS was established a few short years ago, the field from the perspective of IGM was a very different, much less established entity, but over the last decade there has been a significant shift to embrace a media-centric view of computing as a field

worthy of academic inquiry. The faculty of the IGM group strongly believe that the future looks very bright, not only for our programs, but for GCCIS as a whole. Interest in computing at the national level seems to be turning the corner to some degree. But new ways of exploring computing technology, infrastructure, and information demand that we, as academics, explore our world from new perspectives, approaches, and methodologies in addition to the established methods.

GCCIS has tremendous opportunities to continue to succeed in its mission of "enabling and forging innovation." Through collaborative partnership between the various entities within the college, and through a renewed commitment to work together in the service of our students, our staff, our academic programs, and our research endeavors, the future looks very bright indeed. The faculty, staff, and students of the IGM group are ready to continue to contribute our part to what we believe is an important institution – not just to us, but to the field as a whole.

Respectfully Submitted,

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