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<b>Title</b>	Exergaming : a future of mixing entertainment and exercise assisted by mixed reality agents
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<b>Publication date</b>	2010-12
<b>Publication information</b>	ACM Computers in Entertainment (CIE) Magazine, 8 (4):
<b>Publisher</b>	ACM
<b>Link to online version</b>	<a href="http://dx.doi.org/10.1145/1921141.1921147">http://dx.doi.org/10.1145/1921141.1921147</a>
<b>Item record/more information</b>	<a href="http://hdl.handle.net/10197/2794">http://hdl.handle.net/10197/2794</a>
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<b>Publisher's version (DOI)</b>	<a href="http://dx.doi.org/10.1145/1921141.1921147">10.1145/1921141.1921147</a>

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# Exergaming : A future of mixing Entertainment and Exercise assisted by Mixed Reality Agents

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Childhood obesity [Lung and Initiative, 2000] has become a major problem for many countries in recent years and addressing the obesity epidemic remains an outstanding public health issue. Childhood especially in developed countries become one which is synonymous with abundance. Not only food is in abundance but also is Entertainment. Many blame this increase on a lack physical activity on entertainment, in particular on Video Games [Vandewater et al., 2004]. Entertainment in the future need not exaggerate this problem but become a solution, called Exergaming. Exergaming is the combination of words "Exercise" and "Gaming" and its objective is to motivate people to participate in exercise regimes. The exergaming concept combines exercising and gaming by hiding the tiresome side of working out with the fun side of playing to make the exercise process more attractive. The beginning of this new active world in the public imagination started with the Wii from Nintendo. Probably the most well known commercial example of exergaming platform providing a series of games, such as golf, dance and football. This form of Exergaming using a console ,a TV and a living room is a excellent starting point for the concept of Exergaming but this is only the beginning. The concept of Exergaming can encompasses the end of a static location for a game to be played. Exergaming concept will allow entertainment in the future to bring us back to the concept of going outside to play.

To bring players back outside , mobility becomes the next problem to be solved. This can be achieved using Augmented Reality(AR). AR allows a world in which, from the user's perspective, the Virtual and the Physical worlds coexist. Already Smart Phones, Apple's I-Phone and Android powered devices have exergaming applications using the camera's on these devices to give a window into a AR world. Further examples [Cheok et al., 2004] using AR Head Mounted Display(HMD)allow players to see virtual 3D objects placed within the real world around them instead of having to use a mobile device. AR can bring back the Childhood idea of "make believe" which is powerful natural tool for play , it is a idea that is sadly left behind in adulthood. AR can create a make believe world that is a shared experience, one that motivate people play outside again. Combining the notions of imagination with the concepts of exergaming and AR would create an entertainment experience which was truly engaging and could achieve the goals of exergaming. There is one final outstanding problem with this vision, how can such a game be developed.

This final part of this vision can be achieved using Multi-agent systems. Multi-agent systems is a software abstraction paradigms where multiple intelligent agents are embodied within an environment which they can perceive and act upon. Each agents can have different abilities and through working together they can achieve a complete system. This offers an alternative solution

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to the monolithic complex program that would be required to create an experience described above. Agents are a natural fit for a task environment that requires a program to be constantly perceiving their environment and updating accordingly.

Programming for exergaming takes on two forms, one development of the back end software to develop rich immersive augmented reality program and the front end for the user to interact and in effect program the game they wish to play. The back end allows multiple agents each specialists to interpret multiple sensors to help provide a rich immersive AR experience. Other Agents are responsible for creating the virtual imagery for the game. For the front end interfacing component, the “make believe” concept gives us the perfect interface of the imaginary friend. The Agent can influence the game to make sure the exercise component of any exergames must satisfy certain requirements for using the full potential, like personalised “warm up” and “cool down” phases. Exergames should be able to supply games that can be personalised to the requirements of its players. To realise this, it is necessary that the architecture can achieve *adaptive and intelligent* behavior. Intelligent agents can be used easily to integrate multiple sensors for this aim as they can form context model, and reason about them to take decisions that will affect the game. An agent can directly interact with the user to mediate their interaction with the games, changing them according to their wishes and with the players permission tailoring the games to fit their exercise requirements. Agents help by gathering context and by controlling context-aware modifications of the application to respond to environmental circumstances, including the perceived fitness, users’ skill and exercise opportunities, to reach and sustain higher levels of engagement, which ultimately lead to better health outcomes. The vision outlined of how exergaming could develop comes from experiences generated developing “Freegaming” [Gorgu et al., 2010]. A prototype game for exergaming in which smart phones were used to act as the interfaces into AR environment. “Freegaming” aims to extend the exergaming concept to the outdoors. It aims to allow a player to use their own body as an interaction interface for the game instead of a virtual avatar. This can allow a player to exercise in more natural way and combine it with the player’s other daily activities which can consequently improve the associated health benefits. Future entertainment needs to be part of the solution to obesity epidemic rather than the problem. Exergaming is a possible solution, achieving an immersive Augment reality environment mediated by intelligent agents offers a vast array of possibilities for improving entertainment and health in the future.

**Acknowledgements** This work is supported by the National Digital Research Centre (NDRC) Research Grant entitled FreeGaming Project number SP/010 and in part by Science Foundation Ireland under grant 07/CE/I1147.

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