Obesity Epidemic Simulation Based on Behavioral Models and Intelligent Agents

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ABSTRACT

This research work is aimed at proposing a simulation model based on Intelligent Agents devoted to reproduce human behavior influence over the evolution and impact of obesity epidemics. Indeed, obesity is a real big problem for both USA and European countries, so it is necessary to take under control this phenomenon and, above all, to support Agencies and Nations with simulation models in order to promote specific actions, to guarantee population healthy and to reduce the related social costs. To this end, taking advantage of previous experiences on Human Behavior Models, a Library including Intelligent Agents for Computer Generated Forces (IA-CGF Libraries) has been developed. This library is conceived to reproduce complex scenarios with particular attention to non-conventional frameworks on the progression of obesity epidemics in the world where human behaviors play a crucial role. As for the simulation models test, calibration and validation, two scenarios with different underlying social and cultural conditions have been considered and compared, namely: Italy (obesity prevalence ~10%) and U.S.A. (obesity prevalence ~35%). This way, it has been possible to gain fruitful insights about how simulation models evolve over different social and cultural conditions in different countries.

Keywords: Epidemics, Health Care, Human Behavior Modeling, Intelligent Agents, Obesity, Simulation

1. INTRODUCTION

Obesity is becoming an increasingly common and growing public health problem in America and in European Countries (Christakis et al., 2007). Currently, 2/3 of the American citizens are considered overweight, and 30% is obese. According to the Centre for Disease Control report, U.S. Obesity Trends 1985-2007, in 1985, there were only 8 states in the U.S.A.
with prevalence of obesity ~10%, while in 2010, prevalence of obesity increased dramatically, and at least 35.7% of the adult population was obese, affecting all 50 states and men and women (Figure 1a,b). Even more importantly, obesity affects 16.9% of U.S. children and adolescents (Ogden et al., 2010; Magarey, 2001). There was no change in prevalence of obesity from 2009 to 2010, and adults over age 60 were more likely to be obese than younger adults. The question how the growing prevalence of obesity in younger population will affect the overall trend in epidemic; indeed currently the authors are carrying out several researches and developing models to address this problem (Bruzzone, Novak, & Madeo, 2012b).

Obesity is a global problem; indeed obesity epidemic (Wolf et al., 2007; Wang & Beydoun, 2007) has been increasingly spreading around the world in the past three decades, involving countries that previously never reported obesity in their population (Australian Bureau of Statistics 2005). Recently, special scientific series published in leading medical journals such as Lancet examine the global obesity pandemic (Swinburn et al., 2011; Gortmaker et al., 2011)

Figure 1. (a) Obesity rates in United States in 1985, (b) obesity rates in United States in 2010
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