Chapter 5
A Fuzzy-Based Calorie Burn Calculator for a Gamified Walking Activity Using Treadmill

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ABSTRACT

Gamification can be viewed as a process design which encapsulates competition, achievements, status and self-expression. Gamification is used as a tool for improving physical fitness. In this chapter the physical activity using treadmill walking is considered. Calorie burn calculation plays a vital role in the gamification design. In treadmill calorie burn calculation, traditional and fuzzy based methods are compared for effective gamification. In the traditional calorie burn calculation method different equations are used for different incline levels. In the fuzzy logic method fuzzy reasoning technique is applied to calculate the calorie burn for different incline levels. It is identified that fuzzy based calorie calculation enhances physical activity and supports Gamification. Fuzzy based calorie burn calculation methods produces approximate values and supports the players to choose higher incline levels instead of lower incline levels and thereby burning more calories.

INTRODUCTION

Overweight and obese is a growing threat for kids and adults. This is the main cause for many health risks such as heart disease, diabetes, blood pressure, cholesterol and cardio-vascular diseases (Strong, Malina, & Blimkie, 2005). There are many research reviews and published scientific articles examine the need for physical activity and fitness to enhance healthy life style in the present stressful environment (Castelli, Centeio, Hwang,Barcelona, Glowacki, Calvert, & Nicksic, 2014). The number of published articles that examined the relationships between physical activity and fitness is shown in Figure 1.

Figure 1. Number of articles examining physical activity and fitness published yearwise
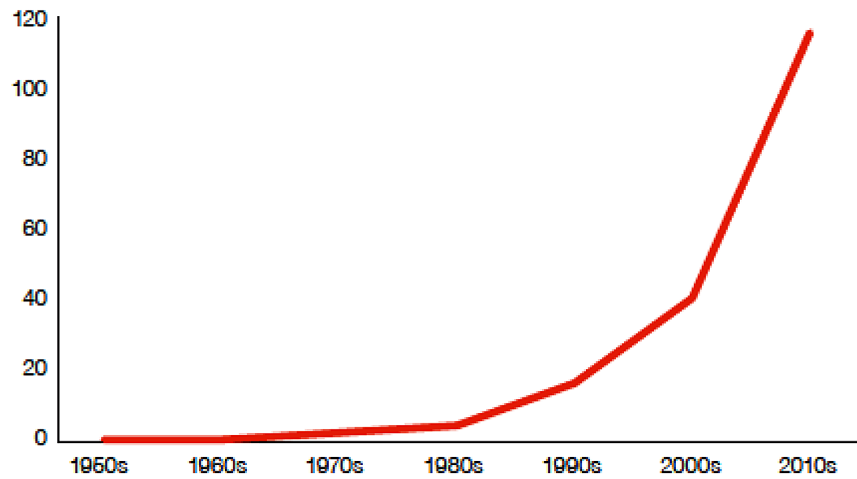
Physical activity can be defined as any bodily movement produced by skeletal muscles that results in energy expenditure (Carl, Kenneth, & Gregory, 1985). A planned, structured and repetitive physical activity is called an exercise (Carl, et al. 1985). There are many physical activities such as house hold work, occupational, sports, etc. that can be performed in daily life for energy expenditure.

The technology development and consistently growing stress in work environment that reflects in personal life reduces the ability of the people to spend energy through physical activities. A regular exercise is required to maintain physical fitness, reduced stress and good health. The low, moderate and high intensity exercise determines the amount of energy spent. The amount of energy spent is measured in kilojoules (kJ) or kilocalories (kcal). The intensity, duration and frequency of muscular contractions determines total amount of calorie burnt (Taylor, 1978).

There are many indoor and outdoor exercises available. The best outdoor exercises are walking, jogging, biking, swimming, and hiking. In spite of recommendations made by several researchers to exercise outdoor to burn more calories, several factors like time, personal safety, allergies and/or weather conditions limits outdoor activities (Atif, Oumair,Daciana, & Evor, 2013). So there is a need for people to make use of equipment to exercise outdoor activities at indoor. The commonly used indoor equipments are treadmill, elliptical, and bike. Among these treadmill is the most common equipment used by wide range of people. Treadmill can be used for various purposes like exercise, training, treatment of stress disorder, etc. which enables the user to set up an indoor exercise that can be carried out irrespective of outdoor conditions. Treadmill is a common piece of equipment that offers variety of benefits such as walk, jog and run. It helps to burn calories, build speed and endurance to improve the health condition. Many treadmills feature calorie counter that estimates the number of calories burnt during the workout.

Gamification is a technology based tool integrated into non-game applications. It increases involvement through participation to achieve pre-defined goals. Though exercising using treadmill is a preferred method for burning calories, there is a lack of motivation to achieve activity goals. Gamification can motivate exercise faster, longer, frequent and enjoyable physical activity. Gamification is defined as "the use of game design elements in non-game contexts" (Deterding, Dixon, Khaled, & Nacke, 2011).

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