



**ISSN: 2454-9940**



**INTERNATIONAL JOURNAL OF APPLIED  
SCIENCE ENGINEERING AND MANAGEMENT**

**E-Mail :**  
**editor.ijasem@gmail.com**  
**editor@ijasem.org**

**[www.ijasem.org](http://www.ijasem.org)**

# The era of online education

Mrs.B Jyothsna , Mrs.Y Basanthi , Mrs.T Sarada

---

## Abstract

*The pandemic of obesity now afflicting most of the industrialized world is widespread. People of all ages and backgrounds are starting their own exercise programs to get in shape, cut calories, and improve their health. Traditionally, hiring a personal trainer was thought to be the most effective way to reach one's fitness goals. These health and fitness experts have degrees in fields like physiology, exercise science, and motivation, and they employ a wide range of knowledge to create and facilitate an individual's exercise plan. Many of a personal trainer's tasks may soon be automatable, because to the widespread availability of cheap sensing technology and the rise of smartphones. Self-managing fitness programs with the help of these "Virtual Trainers" provide many of the same benefits as working with a personal trainer, including careful monitoring, sports science expertise, and motivating features. Several of the most popular "Virtual Trainer" systems on the market as of this writing are discussed.*

---

**Keywords:** *Virtual trainer; exercise; fitness; activity monitor.*

---

## Introduction

There are a number of factors that have contributed to the rise of the "Virtual Trainer" as a topic of interest in the fields of both academic study and consumer electronics. The epidemic of obesity in the developed world is a major public health problem. Obesity is at least partially responsible for some of the main causes of mortality in the United States and the European Union. Obesity is a leading cause of several health problems, including high blood pressure, high cholesterol, high blood sugar, type 2 diabetes, and several types of cancer [1]. Obesity has far-reaching repercussions on a person's quality of life beyond its immediate pathological consequences. Obesity might hinder one's capacity to carry out regular tasks. Dietary restriction and regular exercise are two of the best ways to combat and prevent obesity [2]. Professional fitness trainers have extensive understanding of exercise physiology and the most effective, individualized methods of training. Still, a Many obese persons. who want to reduce weight do not use the services of a personal trainer. This

might be because of the high price tag, social stigma, or a general lack of understanding. The use of the virtual trainer to overcome these barriers has promising potential.

## The Virtual Trainer

Because of the proliferation of smartphones and the decreasing cost of sensors, the Virtual Trainer is a recent phenomenon in the fitness industry. A user may improve their workout routines by incorporating some of the monitoring, encouragement, and instructional expertise that a personal trainer delivers into a personal gadget.

## Existing Technologies

Several "Virtual Trainer" systems are already on the market for regular consumers. This study focuses on a selection of the most popular choices. Although this list is by no means comprehensive, the systems selected illustrate the breadth of features available in a "Virtual Trainer" for the purposes of this research. Figure 1 depicts the systems that will be covered.

---

Associate Professor<sup>1</sup>, Assistant Professor<sup>2,3</sup>

Department of CSE,  
Viswam Engineering College (VISM) Madanapalle-517325 Chittoor District, Andhra Pradesh, India

---



**Fig. 1. Virtual Trainer Systems: (A) mi Coach; (B) Nike+; (C) Endomondo; (D) Polar Heart Rate Monitor & Watch; (E) RunKeeper; (F) Kinect**

In this article, the systems shown in Figure 1 are broken down into three classes: 1) Mobile Apps and 2) Sensors. Thirdly, gadgets that process images. We will break down the benefits that each classification offers. In Table 1 we see a summary of the six trainers' respective skillsets.

**Table 1. Virtual trainer system attributes**

	Hardware	Technologies	Parameters Monitored	Exercise Feedback	Post Exercise Feedback	Training Programs	Users
Nike+	Smart Phone	Smart Phone Application	Distance traveled	Audio feedback		Running	> 4,000,000
	Foot pod	GPS	Speed data	Graphical feedback	Online dashboard	Different Distances	
	Wristband	Footswitch	Altitude data Energy Expenditure			Current Ability	
miCoach	Smart Phone	Smart Phone Application	Distance traveled	Audio feedback		Various Sports	Unavailable
	Foot pod	GPS	Speed data	Graphical feedback			
	Wristband	Accelerometer	Altitude data			Resistive + Aerobic Training	
	Chest Strap Heart Rate Monitor	Monitor	Energy Expenditure		Online dashboard		
	Heart Rate Monitor	Monitor	Heart Rate data			Heart Rate Zones Current Ability	

Polar	Wristwatch	Wristwatch Heart Rate Monitor	Distance traveled	Wristwatch test feedback		Running Cycling	Unavailable
	Chest Strap Heart Rate Monitor	Accelerometer	Speed data		Online dashboard, app, watch interface	Heart Rate Zones	
			Altitude data			Resistive + Aerobic Training	
			Energy Expenditure				
	Foot pod		Heart Rate data				
	GPS module						
RunKeeper	Smart Phone	Smart Phone Application	Distance traveled	Audio feedback		Running Different Distances	6,425,000[3]
		GPS	Speed data	Graphical feedback	Online dashboard	Current Ability	
			Altitude data Energy Expenditure				
Endomondo	Smart Phone	Smart Phone Application	Distance traveled	Audio feedback		Running Different Distances	> 4,700,000
		GPS	Speed data	Graphical feedback	Online dashboard		
			Altitude data Energy Expenditure				
Microsoft Kinect	Kinect	IR Emitter	Body orientation	Audio feedback	Television interface	Resistive + Aerobic Training	10,000,000 Kinect users
	Xbox 360	IR Camera	Body position	Visual form feedback			

By comparing the technology used by these "Virtual Trainers" in Table 1, it is clear that there is little variety. However, each trainer has their own method of dealing with the resulting data.

### Category 1 – Smart Phone Applications

GPS or the inbuilt kinematic sensors are used by "virtual trainers" based on standalone smart phone programs to track exercise. Both RunKeeper and Endomondo, two apps shown in Table 1, use GPS to track users' movements and performance. As shown in Table 1, GPS may be used to determine a wide variety of data points. One limitation of GPS is that it can only be used when in motion, therefore sports like running, cycling, skiing, etc. are excluded. One of the main benefits of this kind of "Virtual Trainer" is that anybody with a Smart Phone may utilize it. The widespread availability of smartphones in industrialized countries makes it possible for trainers to contact large numbers of potential participants. The ability to combine functions from different apps is another reward of utilizing a mobile app. Any of the apps in Table 1 may, for instance, gain by communicating with a diet-tracking service. In reality, RunKeeper just published both the RunKeeper developer program and the Application Programming Interface (API) for integrating with their system.

## Category 2 – Sensor Devices

Any setup with a central controller and an external sensor is considered a "Sensor Device" under the broader "Virtual Trainer" category. Table 1 lists three different systems in this category: Nike+, mi Coach, and Polar. The brains behind Nike+ and mi Coach are your phone, a bracelet, or a dedicated integrated controller. Typically, a wristwatch serves as the brains of a Polar system. Footswitches, accelerometers, heart rate monitors, and external GPS units all make up the array of external sensors. Trainers that are based on sensing devices have the benefit of being more versatile. These devices can track a wider variety of metrics as you work out. The sensor-based devices also escape the limitation of monitoring just actions requiring a change in location, adding to their already substantial monitoring capabilities. Sensors like accelerometers and footswitches allow for the continued monitoring of semi-static activities like treadmill running and stationary bike riding by detecting events like steps. Several methods, such as neural networks, decision trees, support vector machines, Markov models, etc., may be used to make these detections. The number of detectable events may be expanded with the use of these complex detection techniques.

## Category 3 – Image Processing

The idea of processing images is not new. Traditional image processing, however, is notoriously difficult and resource hungry. As a result, only rudimentary use of virtual classrooms has been adopted. Both of these issues are now easier to deal with thanks to the release of the Microsoft Kinect. When an Infrared emitter and camera are used, things are much simplified. With the use of image processing, a "Virtual Trainer" can track a person's every motion and track where their bodies are at all times as they work out. The trainer can then guarantee the most efficient and effective execution of the workout. In Figure 2, we see the "Your Shape" Kinect virtual trainer tracking a user while they complete a punch-squat routine. The left side of the screen is a trainer demonstrating the correct form, while the right side displays the user's actual position and highlights any inconsistencies. Since the Kinect can only see a narrow region, it can only be used for semi-static exercises like squats and press-ups. The "Virtual Trainers" built for the Kinect platform also have the benefit of being easily available. For those who are not accustomed to working out, this might be a helpful way to get through their own mental barriers. There is no need for exercisers to feel ashamed when receiving feedback on their technique or

performance. 246 Gearóid L Lowe and Shane Lowe



Fig. 2. Kinect monitoring exercise performance

## During Exercise Feedback

Feedback is provided to the user in all of the "virtual training" methods covered in this work. This information may include the time elapsed, distance travelled, estimated energy expenditure, average and current speed, and average and current heart rate for systems in categories 1 and 2. There are notable distinctions in the Kinect's real-time input during workout. Trainers using the Kinect platform may give both quantitative data conveyed by other devices and qualitative commentary. As mentioned in Section 2.1.3, the Kinect enables trainers to provide instantaneous feedback on their clients' workout technique and performance. Therefore, the feedback provided while exercising serves to motivate peak performance.

## During Exercise User Interface

The "Virtual Trainer's" feedback during exercise places a premium on a straightforward user interface. It is challenging to use digital networks without interrupting workout regimen. For this reason, it is important that systems have an unobtrusive interface. The bulk of communication between the user and RunKeeper, Endomondo, Nike+, and mi Coach occurs via an audio interface. Audio alerts play at regular intervals or when particular conditions are met. The information shown graphically on a smartphone screen is intended to be as clear and concise as possible. The mi Coach platform has further refined its user-friendly interface. A LED display and multi-coloured LEDs are included into the mi Coach bracelet. A simple push of a button brings up information like your heart rate, calories expended, and the time; however, the display's colourful LED



is meant to give an even less complicated interface. The rate of the LED flashes is proportional to the user's actual heart rate. The user's current heart rate zone is shown by the colour of the LED. The wearer may quickly and easily gauge their workout's intensity based on the colour of the LEDs on their wrist band.

## Post Exercise Feedback

The "Virtual Trainer's post-workout feedback serves two primary purposes. The primary purpose is to facilitate user engagement with and knowledge acquisition from exercise performance history. Examining output over time reveals recurring patterns. If, for instance, an athlete finds that his or her performance gains have stalled out, it could be time to switch up the approach they are taking to training. As its secondary purpose, Exercise consistency is encouraged by receiving post-workout feedback. Several fitness tracker apps like Polar, RunKeeper, Endomondo, Nike+, and mi Coach include online dashboards where you may see your stats after a workout. All system data is compiled in these graphical user interfaces. Graphs and figures are used to present the data in a manner that makes it easy to interpret. The primary purpose made possible by this is the discussion and preparation of future physical activity. The second role of providing feedback on performance is another usage for these digital dashboards. There are a variety of methods to impart inspiration. Reward systems are used to reinforce physical activity. To reward users for their efforts, "badges" are awarded when certain criteria are met. The dashboards display these for the user. Positive peer pressure is also used. You can link up with your friends on RunKeeper, Endomondo, Nike+, and mi Coach. These social networks for fitness are designed to inspire users to work out more often by issuing challenges and highlighting the achievements of their peers.

## Training Programs

Several of the "Virtual Trainers" listed below also give a platform to help with workout program design, in addition to monitoring and motivating features. Nike+ offers a variety of training programmes for runners of all abilities and distance goals. Different run lengths are used in the planning process to account for training and recovery days. You may get comparable ideas from RunKeeper. When compared to the other systems reviewed here, mi Coach has the most comprehensive training options. mi Coach will suggest a regimen based on the user's ultimate aim. The same is true for other sports outside running; training will focus on various aspects depending on the player's skill

level and desired outcome. Aerobic and anaerobic exercise are combined in various programmes. All of these tools will track the user as they go through their selected workout routine and provide guidance, as necessary.

## Conclusion

There is a wide range of technologies that have yet to be introduced into the realm of sports and exercise, and some are scheduled for release in the near future that will make a significant impact to the virtual trainer. Incorporating wearable technology into the "Virtual Trainer" might be one of the most important technological advances in this area. The fitness sector has benefited from the introduction of virtual trainers. A virtual trainer should be created in conjunction with personal trainers, sports scientists, and behavioural scientists to maximize the effectiveness of an exercise program.

## Acknowledgements

The Georgia Institute of Technology (Ireland) is collaborating with the Irish Research Council for Science, Engineering, and Technology on this project.

## References

- [1] WHO, "Physical Activity and health in Europe: evidence for action," 2006.
- [2] K. Shaw, H. Gennet, P. Rourke, and C. Del Mar, "Exercise for overweight or obesity (Review)," *Cochrane Database of Systematic Reviews*, no. 4, 2006.
- [3] "RunKeeper Blog." [Online]. Available: <http://blog.runkeeper.com/health-graph/health-data-infographic>.
- [4] "Kinect Blog." [Online]. Available: <http://www.xbox.com/en-US/Press/Archive/2011/0308-Ten-Million-Kinects>.