A Method of Designing a Ubi-coach system: A Training system for cycling sport

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ABSTRACT

An Ubi-coach cyclist training system for monitoring and analysing the performance of a cyclist and provides a scalable coaching feedback. During coaching, cyclists are equipped with wireless sensors in order to acquire sports specific parameters like heart rate, blood pressure level, speed and distance covered and report context related information. The Ubi-coach system encourages the cyclist to his/her best within the conditions available. It is a multifaceted advisor for International cyclists. The coach system works in three phases, In phase I, it records the current performance of the cyclist, In phase II, it motivates the cyclist by explaining historical performances in similar conditions, and phase III, it advises the cyclist over the diet, physical , mental fitness and medical preconditions. Ubi-coach system provides experts subsystems like clinician subsystem and coach subsystem, that perform functional health assessment of cyclist and provides timely feedback accordingly to improve cyclist fitness. Profile Database stores personal information of cyclist like age, gender, weight , height as well as implicit information acquired during exercise for fitness domain, the number of times the user completed a particular exercise, the amount of time spent for a particular training goal. Current record database stores cyclist information acquired or derived from sensors. Decision Analyser subsystem decides the exercise plan for the cyclist based on advice from Clinician and Coach subsystems. This paper describes system design considerations and systematic implementation to meet various practical needs and provides scalable training solutions to multiple cyclist under different terrain conditions regardless of time and space.

Keywords: Ubi-coach cyclist training system, Clinician subsystem, Coach subsystem.

1 INTRODUCTION

With computers being used in education field, e-learning, e-training came into people's life. With the development of the automatic identification techniques and the embedded techniques, Ubiquitous Services and Ubiquitous Learning System came to be highlighted as a new field. A Ubiquitous Learning System is context aware; that is, the system senses learner's situation or the situation of the real-world environment in which the learner is located and then actively provides personalized support in the right way, right place, and right time[1]. Specialty about Ubiquitous Learning (U-Learning) compared to e-learning and m-learning is, in case of e-learning and m-learning, the system understands the learner's situation by just accessing the database, where as in the ubiquitous learning, the system understands the learner's situation not only via the database, but also by sensing the learner's location, personal and environmental situations in the real world.
U-Learning becomes a very important part in one's learning process especially in self-learning. Even mobile devices can be taken with a learner in everyday life, to provide more effective supports. To do this, the cooperation with ubiquitous devices such as sensors and embedded computers is necessary. With the improvement of ubiquitous technology, more and more services and supports can be provided to learners. The main characteristics of ubiquitous learning are the following[2]:
Permanent: Details on work will be retained, unless it is purposefully deleted. Everyday, continuously learning processes are recorded.
Accessible: Learners are able to access to their documents, data, or videos from anywhere. Based on learner's request, the information is provided.
Immediate: Immediately learners are able to get information from any where. Very helpful to the learners to solve their problems quickly.
Interactive: Interaction with teachers, experts and peers is possible. Any queries on knowledge becomes more available.
Instructional activities: The problems faced as

well as the knowledge needed for day to day life are all presented in their natural and authentic forms. Thus learners observe the features of problem that make particular actions more suitable.
Adaptability: Learners are provided with correct information at the right place in right way. However, learning system have an important function helping the learner improve his ability. In this paper, we have designed a Ubi-coach system for coaching a cyclist in multiple environments.
The rest of the paper is organized as follows. The next section gives some of the previous works on Ubiquitous Learning Systems. Section 3 discusses the proposed system for ubiquitous coaching application. Section 4, gives the exercise optimization plan by Decision Analyzer. and Section 5 gives the simulation setup and results. Finally, conclusion in Section 6.

2 Previous Works

Philips Virtual Coach [3] employed an agent which acted as a personal coach to motivate the trainer. The coaching system is meant to be used at residence with a ergometer. Agent is projected on a screen, which also shows a virtual environment with open-air landscape. 24 cyclist were studied, the authors showed that the embodied agent lowered perceived pressure and tension, while the virtual environment offered fun and had a beneficial effect on motivation. This coaching system only provided the cyclist with details about heart rate, instead of motivating by reporting the calories burnt or speaking about other benefits of physical activity.
Eye-Toy is a Kinetic [4] indoor fitness training system for the Play station 2 and exploits an Eye-Toy camera, i.e., a cheap webcam-like device, which detect user's movements. The application allow the user to choose between a male or female personal trainer and create an individual 12-week plan, taking into account user's height, weight, age, familiarity with Eye-Toy games and physical condition (by means of a short questionnaire). The application adopts a game style, presenting martial arts and cardio exercises as entertainment.
Personal Wellness Coach [5] is another system that tracks user's movement, monitors heart rate, and provides music feedback. This wearable system can send the data produced by an heart rate monitor, an accelerator and a body temperature sensor to a laptop that can be up to 9 meters away. Beside providing music feedback, the system can warn of over exertion and motivate the user with interactive audio. Anyway, the need for a laptop limits the wearability of Personal Wellness Coach. As a result, mobile physical activities, such as outdoor running and exercising on fitness trails become impractical. Works on indoor applications has been carried in Ubiquitous Learning System that, not only provides supports depending upon learner's request, but additionally it can also help a learner modify his/her behavior based on systematic shaping principle[6]. In an other application [7],
they have measurement and control functions were embedded in a single wearable unit to personal customizing machine based exercise. A wearable unit was capable of outputting control signals that provided the appropriate exercise levels, based on exercise programs and measured bio-signals. To monitor user's physiological parameters (e.g., heart rate, temperature) during physical activities, Knight et al. [8] proposed the **SensVest**, a wearable device integrated in a T-shirt that can measure user's heart rate, body temperature and acceleration and send them to a remote computer. This device focuses on sensing aspects and does not come with Analysis or training applications that could run on a mobile device.
Polar heart rate monitors [9] are commercial wearable devices that consists of a wrist-worn watch unit and a chest-worn heart rate sensor. Besides measuring heart rate and deriving other parameters, such as burnt calories, Polar devices can give basic motivational feedback, such as calorie bullets, i.e., beeps that occur every time a certain amount of calories is burnt, inciting the user to keep running and burn other calories[10].
In our system, some of the practical needs of the cyclist were considered. Usually Cyclist visit the health club for the following requirements:
•For improving stamina and maintenance
•For building up for competition
•During Competition Period
•For Transitional recovery period for fitness
Within all these phases, there are certain type of exercise to be done to improve explosive quickies interval, uphill exercise to improve aerobic fitness and exercises that help the body to recover. Cyclist would also get plan to improve from weakness and avoid observed failure. If cyclist breaks down at the end of an exercise, Ubi-coach systems sends instructions for slowing the speed or for halting the cycle getting appropriate feedback from subsystems.

3 Proposed Ubi-coach system

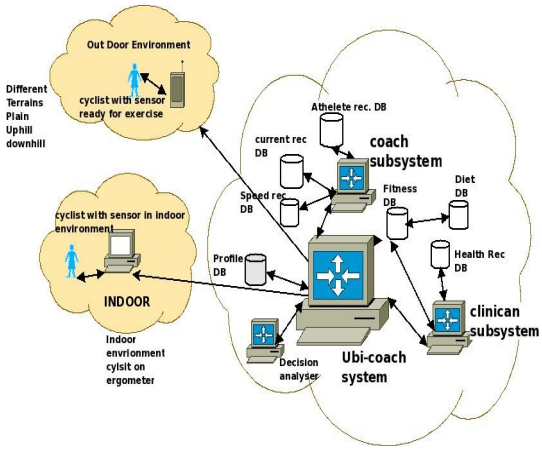


Figure 1: An Overview of the Ubi-coach system

The overview of the proposed Ubi-coach System is shown in the Fig 1. The System works in both indoor and outdoor environment.

Outdoor environment: In outdoor environment, we assume different terrains such as downhill, uphill, plain and muddy. Bicycle is embedded with sensors that senses cyclist sport related parameters like BP, heart Rate, speed and distance covered by the cyclist.

Indoor environment: In indoor environment, ergometer cycle is embedded with sensors to record the cyclist blood Pressure and heart rate, speed and distance covered.

Ubi-coach system continuously monitors the cyclist speed and distance both in indoor and outdoor environment. Periodically collects context data from sensors, exploited in reasoning actions done by decision Analyser, serving the cyclist by providing exercise plans automatically. Clinician keeps track of cyclist health status. In case of some variations in cyclist vital body signs, immediately clinician an subsystem sends advice to Ubi-coach system, that interacts with Decision Analyser that decides the exercise plans meant for the the cyclist in that situation. Coach subsystem compares and tracks the speed and distance covered by the cyclist with that of cyclist-expert and sends motivational advices to Ubi-coach system and provides sports oriented exercise plan for the cyclist to improve his/her stamina, strength, etc.

3.1 Ubi-coach system architecture

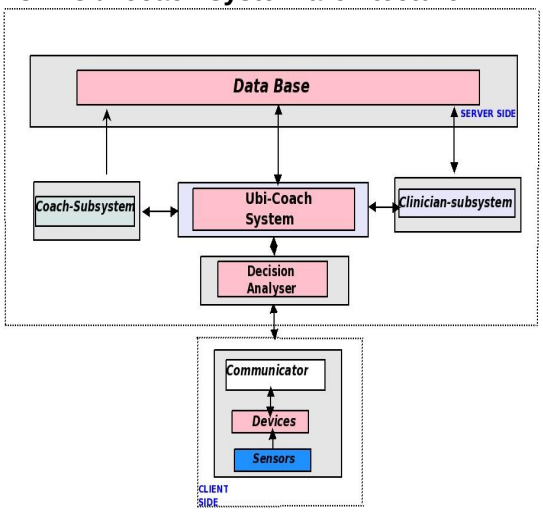


Figure 2: Ubi-coach system architecture

The architecture of our proposed Ubi-coach system is based on Client-Server model as shown in the Fig. 2, where client will be the cyclist, as the learner.

3.3.1 Client side components

The Client side consists of three major components like Sensors, Devices component and Communicator component.

Client's main function is to communicate with sensors, to setup configuration, data acquisition, etc., to pre-process the measured data and to transmit the data packets to the server. Client established an HTTP connection and forwards the data to the server or in case of temporary interruption, buffers the data packets locally. Depending on the signal strength of surrounding radio cells, the underlying communication interface (ie., GPRS & WLAN) is automatically selected by the operating system of the mobile phone[12].

Sensors: The sensors are used to sense the Sports based parameters like, speed and distance covered by the cyclist during exercise session. The automatic bicycle gear selector is a device that can be added to the frame of an existing bicycle.

The derailleur is controlled by a step motor which provides the proper tension on the derailleur cable to switch and hold the gear. The motors are controlled by a PIC microprocessor through a motor driver. Sensors near the crank sense the cyclist sports related parameters and how fast the rider is pedaling and signals the microprocessor to change gears accordingly. Polar Power sensor[13], MEDICMON-600 UJ are some of the sensor products for getting heart Rate, BP, speed, distance, training time, lap time, lap distance and calories. RFID sensor is used to identify the cyclist on workout.

Devices: Devices include mobile terminals, fixed terminals and computer controlled bicycles. Handheld devices like PDA and Mobile Phones with WiFi and GPRS connectivity were used in outdoor environment and laptop and desktop were used as fixed terminals in indoor environment.

Communicator: This component acts as an interface between the Client and Server. The communicator is in fact a socket program, which sends messages
across the two parties following a certain protocol for the successful operation of the Ubi-coach System.

3.1.2 Server side components

The Server is the core of the system. It consist of Coach and Clinician Subsystems and the Decision Analyser system and the Ubi-coach main System is supported by the information in the following five databases.

- **Profile Databas**e: Personal and keep-fit activities of cyclists are stored in this database as shown in Figure 3.
- **Current Record Database:** records the Cyclist's current speed, distance and sports related parameter details like Heart rate especially projected heart rate per minute as well as the time difference between two heart beats at sampling rate of 4 Hz. In conjunction with heart rate, the lag can be used for calculating the heart rate variability in Figure 4.
- **Athlete Record Database:** Standard achievement records of cyclist-experts throughout the world are stored in the this database as shown in Figure 5.

•**Health Record Database**: Details on required health conditions for different age groups are stored as shown in Fig 6, where HR: Heart Rate, BP-SR: Blood Pressure (Systolic Range), BP-DR: Blood Pressure (Diastolic Range).

•**Speed Record Database**: Hypothetically required speed conditions for different age groups and terrain conditions are stored in this database as shown in Figure 7.

•Figure 8 indicates different cyclist_categories like novice, moderate and expert.

Age	HR-N	HR-M	HR-AN	SR-L	SR-M	SR-H	DR-L	Dr-M	DR-H
20-29	98	127	166	109	121	133	76	80	86
30-39	93	120	157	111	123	135	78	82	84
40-49	88	114	149	115	125	139	80	84	88
50-59	83	107	140	118	131	144	82	86	90

Figure 6: Health Record Database

Terrain	Age	Speed-L	Speed-H
Plain	20-29	30	50
Uphill	20-29	20	30
Downhill	20-29	40	60
Muddy	20-29	25	30

Figure 7: speed Record Database

Sr.No	Cyclist_category
1001	Novice
1002	Moderate
1003	Expert

Figure 8: Cyclist_category

Ubi-coach system: During coaching a cyclist, the Ubi-coach system gets context data like cyclist BP , HR, Distance covered and speed from sensors both in Indoor and Outdoor environments. Context data of the cyclist is compared with Health record database and Athlete record database. Ubi-coach system coordinates with Decision Analyser subsystem that decides the exercise plans for the cyclist based on advice from Clinician and Coach subsystems. Ubi-coach system either decreases or increases the speed or halts the cyclist based on cyclist health condition, category and goal. Thus Ubi-coach system advises the cyclist over the diet, physical , mental fitness and medical preconditions as shown in algorithm 1.

Algorithm 1 Ubi-coach system

Begin
INPUT: cyclist_ serial_number, cyclist_category
OUTPUT: cyclist_exercise_plans
get cyclist_BP, cyclist_HR, cyclist_speed, cyclist_distance_covered of cyclist_serial_number
If (cyclist_category= =Novice||Moderate||Expert)
If ((cyclist_BP and cyclist_HR == Normal) && (cyclist_speed==low)&&(cyclist_distance_covered<= minimum))
get clinician_advice: continue with same diet.
get coach_advice: continue with same speed,duration.
Else If ((cyclist_BP and cyclist_HR != Normal)&&(Cyclist_speed==low)&& (cyclist_distance_covered !== minimum) && (cyclist_category==Novice||Moderate))
get clinician_advice: take compulsory rest and improve diet.
get coach_advice:Halt cycling
Else If ((cyclist_BP & cyclist_HR !=Normal) &&(cyclist_speed==low, cyclist_distance_covered! =less)&& (cyclist_category==Expert))
get coach_advice:Decrease Speed, duration.
End If End If End If
send coach_ advice and clinician_ advice to Decision Analyser
get cyclist_exercise_plans from Decision Analyser.
Send cyclist_exercise_plans to cyclist
End

Clinician Subsystem: It maintains health record database of the cyclist. In this database, details on required health conditions for different age groups are stored, where HR: Heart Rate, BP-SR: Blood Pressure (Systolic Range), BP-DR: Blood Pressure (Diastolic Range). Health record database is compared with current record database of the cyclist on training that records the cyclist's current speed, distance and sports related parameter details like Heart rate especially projected heart rate per minute. In case of some serious health problem with cyclist, Clinician subsystem immediately sends advice to Ubi-coach system to give rest to cyclist or reduce duration of workout and details on diet etc. as described in algorithm 2.

Algorithm 2 Clinician subsystem

Begin
INPUT: cyclist_serial_number, cyclist_category
OUTPUT: clinician_advice /*For health improvement*/
get cyclist_BP, cyclist_HR, cyclist_speed, cyclist_distance_covered of cyclist_serial_number
If ((cyclist_BP && Cyclist_HR==Normal)&& (cyclist_category==Novice||Moderate))
clinician_advice:Improve diets, diet pattern, medicine.
Send clinician_advice to Ubi-coach system
ElseIf ((cyclist_BP && cyclist_HR==Normal)&& (cyclist_category==Expert))
clinician_advice: continue with same diet and vitamins.
Send clinician_advice to Ubi-coach system
ElseIf ((cyclist_BP && cyclist_HR==Abnormal)&& (cyclist_category==Novice||Moderate || Expert))
clinician_advice: stop exercise, take rest

Send clinician_advice to Ubi-coach system
End If End If End If
END

Coach Subsystem: Coach Subsystem maintains Athlete record database that has standard achievement records of cyclist-experts throughout the world. It compares Cyclist current record database, especially cyclist speed and distance covered with Athlete record database and based on cyclist category and goal sends advice to the Ubi-coach system either to increase the speed or decrease the speed, duration of exercise to improve cyclist fitness level. In case of emergency, advices to halt the exercise. Algorithm for Coach subsystem is as follows.

Algorithm 3 Coach subsystem

Begin
INPUT: cyclist_serial_number, cyclist_category
OUTPUT: coach_advice /*based on cyclist_category to improve fitness*/
get cyclist_BP, cyclist_HR, cyclist_speed, cyclist_distance_covered of cyclist_serial_number
If ((cyclist_speed && cyclist_distance_covered==Normal)&& (cyclist_category==Novice||Moderate))
coach_advice=Increase cyclist_speed, cyclist_distance_covered , based on cyclist_goal
Send coach_advice to Ubi-coach system
If ((cyclist_speed==high)&& (cyclist_category==Expert))
coach_advice:continue same cyclist_speed & duration
Send coach_advice to Ubi-coach system
ElseIf ((cyclist_BP && cyclist_HR==Abnormal)&& (cyclist_category==(Novice||Moderate) (cyclist_speed==high))
coach_advice : stop the exercise
Send coach_advice Ubi-coach system
ElseIf ((cyclist_BP, cyclist_HR==Abnormal)&& (cyclist_category==Expert || cyclist_speed==high))
coach_advice: decrease_speed, duration
Send coach_advice to Ubi-coach system.
EndIf EndIf EndIf EndIf
END

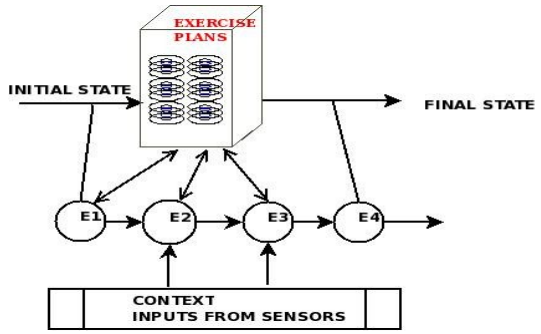


Figure 9: Decision Analyser

Decision Analyser (DA): Figure 9 shows the Decision Analyser and exercise management plan that helps to reduce the gap between the cyclist current status and goal.
Decision Analyser involves formulating the exercise plan via prescription rules at a particular time. The cyclist goal is decided by prescription rules and an evaluation table that has been designed by experts, based on advice from coach, clinician and cyclist_category and fitness. Also, if suddenly cyclist's health status changes, decision Analyser reorganizes exercise plans accordingly[14].
Certain exercises needed to be repeated twice, thrice etc, where as certain exercise to be done just once. Figure 10 shows different exercise plans of Decision Analyser[15]. Algorithm 4. gives the details of the exercise plan.

cyclist goals BP: 120/80 HR	Exercise Number	speed Kmph	Exercise type & Number	Exercise order
For improving stamina	0	1-12	1st type, inclined, plain, mountain	5 times
	1	12-20		
Before competition	2	20-30	2nd type, inclined, declined, plain, mountain, muddy	3 times, 2times
During Competition	3	>30	3rd type, intense, inclined, declined, mountain, muddy,water	3times, 2times, 1time
For Transistional recovery for fitness	4	>20	1st and 2nd type plain, mountain & muddy	1 time, Repeat till comfort
BP>140 HR>80	H	A	L	T

Figure 10 : Exercise Plans by Decision Analyser

Algorithm 4 Decision analyser

Begin
INPUT-coach_advice, clinician_advice, cyclist_goal.
OUTPUT-cyclist_exercise_ plans
get coach_advice, clinician_advice from Ubi-coach system.
If (cyclist_goal == increasing the stamina)
cyclist_exercise_plans = exercise 1 with speed 1-12 kmph with 1 time repetition
ElseIf (cyclist_goal == before competition)
cyclist_exercise_plans = exercise 2 with speed 20-30 kmph with 2 times repetition
ElseIf (cyclist_goal == during competition)
cyclist_exercise_plans = exercise 3 with speed more than 30 kmph with 1 time repetition
ElseIf (cyclist_goal == recovery period)
cyclist_exercise_plans = exercise 4 with speed 1-10 kmph with 1 repetition
End If End If End If End If
send cyclist_exercise_plans to Ubi-coach system
END

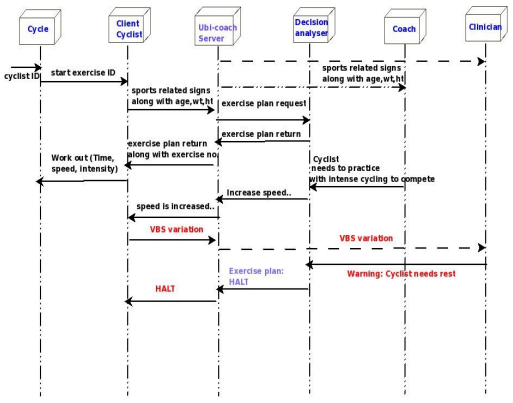


Figure 11: Sequence of exercise management

The Fig. 11. shows the sequence of events happening for the proposed Ubi-coach system. The sequence of events starts with the learner's Vital Body Signs being provided to the Ubi-coach main system. Then this data is used by the various components of the system to give appropriate advices to motivate the learner to achieve his/her goal[16].

4 Simulation Procedure and Results

We have simulated the Ubi-coach System of a cyclist both in an indoor and outdoor environments, by considering VBS like heart rate, BP, speed, distance. Simulation environment is as shown in the Fig 13.

Case 1: Cyclist in indoor environment

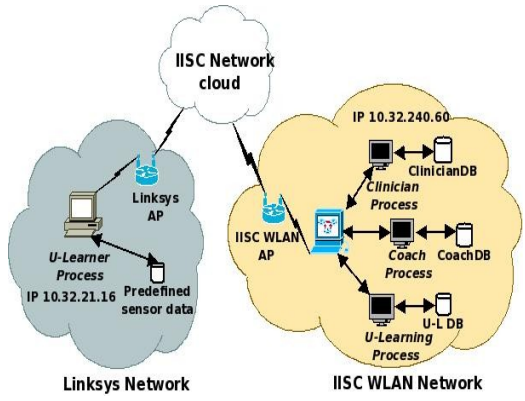
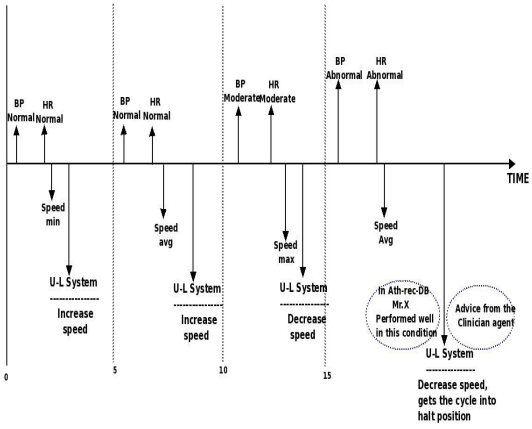


Figure 13: Simulation environment

Initial Setup:

1. Cyclist in indoor environment on ergometer, embedded with different sensors that measures speed, distance , etc..
2. Initiation of Ubi-coach System.
3. Terrain is plain.
4. RFID sensor identifies cyclist on workout and gets his profile details.
5. The system monitors cyclist body conditions like HR, BP with the help of wearable sensors.
6. Discrete event monitoring is show in figure 14.

Table 1



Event Se-quence	Events
E-1	Cyclist starts workout
E-2	Ubi-Coach System monitors cyclists health condition, compares with health record database.Checks if the speed of the cyclist is less/more compared with speed record database, the exercise plan increases/decreases the speed automatically by changing the gear position.
E-3	Cyclist continues workout with the same speed.
E-4	System monitors the cyclist sports related parameters for the next duration of time slot, if Health continues to be normal and speed is average, then the exercise plan increases the speed automatically.
E-5	Cyclist continues workout with the same speed.
E-6	If the HR and BP is moderate and the speed is maximum, in the next time slot, then the exercise plan decreases the speed automatically. In case if the speed is average, the system lets the cyclist to continue workout with the same speed.
E-7	Cyclist continues workout with the same speed.
E-8	If the HR and BP is high and the speed is average in the next time slot, then the system refers Athlete Record Database and checks if other athlete has performed well under this health condition, accordingly consults the Clinician Subsystem for advice
E-9	Under abnormal health conditions, the Clinician Subsystem checks the Fitness Record Database based on the performance of the cyclist and advices the System to either increase or decrease or halt the cycle accordingly. For example, if the cyclist is a beginner, then the system gradually decreases the speed or halts if the cyclist health condition is bad. In case, the cyclist is moderate in his performance with high speed, but BP, HR is very high, then the Clinician Subsystem advices the Ubi-Coach System to continue with the same speed as referred with fitness Record Database.
E-10	If cyclist's BP, HR doesnotstabilize, then Clinician Subsystem advices Ubi-Coach System to halt the workout immediately after certain time slot.
E-11	In case of expert cyclist, under abnormal health condition, Clinician Subsystem will advice the Ubi-Coach System to continue with same speed for some more time slot as compared to moderate cyclist and then decides to halt or continue.
E-12	Advices from Clinician Subsystem and Coach Subsystem are sent to the Ubi-Coach System based on final performance of cyclist regarding health and ranking.
E-13	Ubi-Coach Learning System finally motivates the cyclist, by sending advices to improve his health and performance.

Figure 14: Event sequence in Indoor Environment

In table 1, we present the chronological events of the Ubi-coach system for training a cyclist in an indoor environment.

Case 2: Cyclist in outdoor environment Initial Setup

1. Cyclist in outdoor environment on bicycle, which is embedded with different sensors to measure speed, distance, etc..
2. Initiation of Ubi-coach system.
3. Different terrains like plain, uphill, downhill and muddy.
4. Cyclist identification is done with the help of RFID sensor.
5. The system monitors cyclist body conditions like HR (heart rate), BP (blood pressure) with the help of wearable sensors.
6. Discrete event monitoring is show in fig 15.

Events for different time slot is explained below. In this table 2, we present the chronological events of the Ubi-coach system for training a cyclist in an outdoor environment.

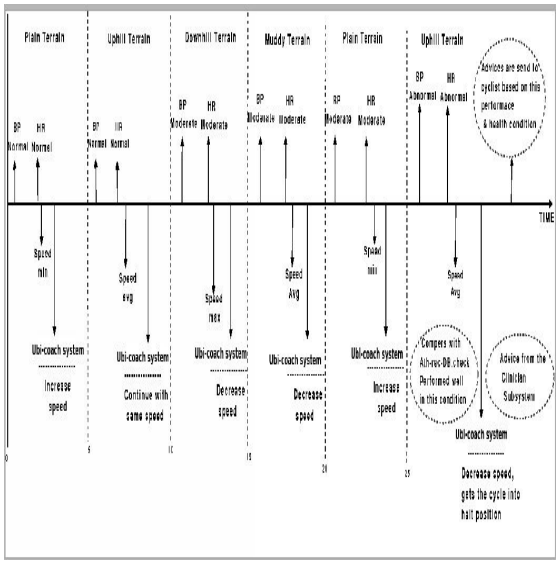


Figure 15. Event monitoring in outdoor environment

Event Se-quence	Events
E-1	Cyclist starts his workout.
E-2	Sensor identifies the terrain in which the cyclist is cycling. Based on terrain, the Ubi-Coach System monitors cyclists sports related parameters like HR & BP and speed, As seen the figure, in plain terrain, for the first time slot, cyclist HR and BP was normal and speed was minimum, then the Ubi-Coach System increases the speed automatically by changing the gear.
E-3	Cyclist continues cycling with the same speed.
E-4	Ubi-Coach System identifies the terrain as uphill in the next time slot and now monitors the health condition of the cyclist, if the HR and BP is still normal and the speed is average, then the Ubi-Coach System continues with the same speed.
E-5	Cyclist continues cycling with the same speed.
E-6	In the next time slot, Ubi-Coach System identifies the terrain as downhill, again monitoring of the health condition is continued, HR and BP is moderate and the speed is maximum, then the Ubi-Coach System exercise plan decreases the speed automatically changing the gear position.
E-7	Cyclist continues cycling with the same speed.
E-8	Terrain is muddy in the next time slot, HR and BP seem to be moderate and the speed average, then the Ubi-Coach exercise plan system decreases the speed of the bicycle by automatically changing the gear.
E-9	Cyclist continues cycling with the same speed.
E-10	In the next time slot, the terrain is plain, cyclist HR and BP is moderate and the speed is minimum, then the exercise plan increases the speed automatically.
E-11	Cyclist continues cycling with the same speed.
E-12	The System checks the terrain for the next time slot. The terrain is uphill, and the cyclist here is novice, the HR and BP is high and the speed is maximum, then the Ubi-Coach System refers with Athlete record and checks if any athlete has performed well, with this health condition, and consults the Clinician Subsystem for advice. The Clinician Subsystem checks the fitness record database and finds that cyclist is beginner. As the performance of the cyclist is poor, Clinician Subsystem advices the Ubi-Coach System not to continue. so the Ubi-Coach exercise plan system gradually decreases the speed and finally halts the cycle.
E-13	Ubi-Coach System finally motivates the cyclist, by sending advices to improve his health and performance.

Table 2

5 Performance Analysis of cyclist on workout:

Performance of the cyclist is continuously monitored and evaluated to check if the cyclist has achieved the goal target. In case, if he needs to improve his performance, different exercise plan is automatically presented to him. Cyclist has been evaluated on based on his performance styles, based on four important sport related parameters like heart rate, blood pressure, speed and distance covered.

Algorithm 5 gives the performance analysis of cyclist.

Algorithm 5 Performance analysis of cyclist Algorithm

Begin
INPUT : cyclist_BP, cyclist_HR, cyclist_exercise_plans
OUTPUT: cyclist_performance
If ((cyclist_ BP && cyclist_ HR== Normal) && (cyclist_exercise_plans== completed))
cyclist_performance=Excellent /*continue with same exercise plan and diet*/
ElseIf ((cyclist_ BP && cyclist_ HR== Abnormal) && (cyclist_exercise_plans== Partially_completed))
cyclist_performance=Reasonable /*Improve revised exercise plans and diet*/
Else (cyclist_exercise_plans== Not completed)
cyclist_performance=Not completed /*Needs Attention*/
End If
End

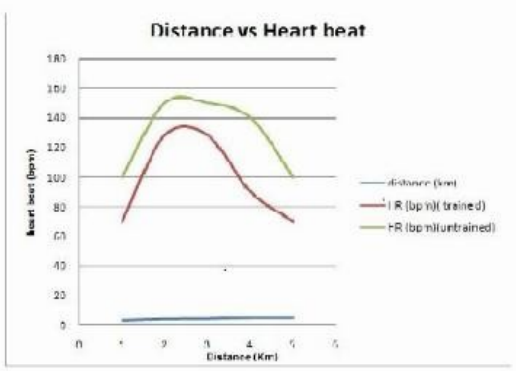


Figure 12: Cyclist HR(bpm) before & after exercise

Figure 12, shows cyclist Heart-beat(bpm) before & after training. Before training, the heart rate (which is an indicator of the stress the body is undergoing) quickly rises to within five beats per minute of his maximum compared with after exercise as seen figure[17]. Cyclist performance in the initial stage of coaching, may vary based on different environment and also health conditions. Cyclist after undergoing training system has lots of improvement as a achiever.

6 Conclusion

The proposed system is the new thinking towards Ubi-coach System. The work defines an overall Ubi-coach System with a working model. The idea of having a Ubiquity mechanism being incorporated in the learning application based on both indoor and outdoor environment with wearable sensors that senses cyclist sports based parameters heart beat, speed and distance covered etc. Proposed Ubi-coach System provides the appropriate exercise levels based on cyclist health conditions. The design of our system is a progressive step towards establishing a convenient and continuously supported wellness environment.

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