



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

Geo-Mapping of Trees Planted in the College Campus Premises Using Smart Phone Based GPS

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ABSTRACT: Trees are our best friends because they clean the air we breathe. They are like the third lung to us. Though they are detached from our human body, they are responsible to produce the oxygen that we inhale and absorb the CO₂ that we exhale. Apart from Physiological aspects, trees are very important part of architecture and human civilizations. They create beauty and pleasant experience as well as protection us from wind and sun. There are many types of trees and many of them have medicinal value. In educational campuses many types of trees will be found to be planted for all above benefits. However, hardly someone keeps the record of their planting locations, and other details like type, species, family, benefits, etc. Today is a fast growing digital world with 60 million smart phone users in India alone. Therefore it is possible to create such records with ease. Through this paper the authors have attempted to discuss on low cost approach that was tested and implemented for such a cause.

KEYWORDS: Android, App, Climate Change, Global Warming, GNSS, GPS, Waypoints, Instrumentation, ios, Mapping, Precision Agriculture, Proximal Soil Sensing, Smart Phones.

I. INTRODUCTION

Trees play an important role in our environment and human well-being. Trees provide us with fresh water to drink, air to breathe, shade, and food for people, animals, and plants. Trees provide a place of spiritual, cultural and firewood for various types of flora and fauna habitat, building materials, cooking, warmth and entertainment value. Trees are very important to the health of the global environment and the species that inhabit it and they need our unconditional care and protection. Trees also play an important role in all communities. The streets, parks, playgrounds and backyards are full of trees, creating a peaceful, aesthetically pleasing atmosphere. Trees enhance our quality of life by bringing natural elements and wildlife habitats to the urban environment. In some areas, there are fairly mature trees that serve as historic landmarks and show the pride of the city. Trees play an important role in our lives and provide seamless service to the environment. Today we are affected by the negative effects of global warming, serious pollution and other deforestation because we somehow did not protect them. Trees are often used and can be cared for so that people can survive on this planet. We should help others plant more and more trees. It's for our own progress, and the sooner we understand this, the better for us [1].

Everyone needs to recognize the importance of tree planting and motivate and inspire others to plant more trees. Not only do today's generations enjoy the benefits of trees, but future generations also need to enjoy the benefits of trees. Mature deciduous trees produce as much oxygen in a season as 10 people breathe in a year. One hectare of wood uses the same amount of carbon dioxide produced each year when the average car travels 42,000 kilometres. The same acre tree also produces enough oxygen for 18 people to breathe for a year. A 100-foot-high tree with a diameter of 18 inches at the base produces 2722 kilograms of oxygen. On average, trees produce about 118 kilograms of oxygen annually. Two mature trees can provide enough oxygen for a family of four. Humans need oxygen to live. Let's just say that oxygen is needed to support cellular respiration without becoming too technical. A person consumes a huge amount: an average of 550 litres (about 0.5 m³) of oxygen per day. The minimum concentration of oxygen in the air required for human breathing is 19.5 percent [1].

Climate change refers to long-term changes in temperature and weather patterns. These shifts can be natural, for example due to fluctuations in the solar cycle. However, since the 19th century, human activity has been a major cause



of climate change, primarily due to the burning of fossil fuels such as coal, oil and gas. Burning fossil fuels creates greenhouse gas emissions that wrap around the earth like a blanket, trapping the heat of the sun and raising the temperature. Examples of greenhouse gas emissions that cause climate change are carbon dioxide and methane. These occur, for example, by using gasoline to drive a car or coal to heat a building. Logging of land and forests can also release carbon dioxide. Landfills are a major source of methane emissions. Energy, industry, transportation, buildings, agriculture and land use are the main sources of emissions. Greenhouse gases are gases that absorb and emit radiant energy in the thermal infrared range, causing the greenhouse effect. The most important greenhouse gases in the Earth's atmosphere are water vapour, carbon dioxide, methane, nitrous oxide and ozone [2].

Humans and wild animals face new challenges for survival because of climate change. More frequent and intense drought, storms, heat waves, rising sea levels, melting glaciers and warming oceans can directly harm animals, destroy the places they live, and wreak havoc on peoples livelihoods and communities [3]. As climate change worsens, dangerous weather events are becoming more frequent or severe. People in cities and towns around the several countries including India are facing the consequences, from heat waves and wildfires to coastal storms and flooding [4,5,6].

As a result of climate change, humans and wildlife face new survival challenges. More frequent and severe droughts, storms, heat waves, sea level rise, glacier melting, and sea warming can directly harm animals, destroy habitats, and devastate human life and communities. As climate change worsens, dangerous weather events become more frequent or more serious. From heat waves and wildfires to coastal storms and floods, people in cities and towns across the United States are dealing with aftermath [7,8].

With a current population of 7.9 billion, the world's tree density estimates revise the per capita tree ratio from 61: 1 to 422: 1 [9]. Tree decline is actually one of the causes of forest degradation, including overall loss of tree vitality, low productivity tree growth, tree dieback, and even reduced soil fertility. increase. The main causes of forest decline are 1) industrial and agricultural pollution, and 2) stressors. Examples: dryness, 3) changes in stand dynamics, 4) reduction of forest diseases or diseases of complex etiology, 5) reduction of productivity and / or soil fertility in pure plantation forests [10].

Keeping a record of trees helps to study vegetation types and provides complete information about a particular tree type. It provides information on climate change and its impact on tree growth. This is a way to educate the community and raise awareness about environmental protection. Plants are the only source of oxygen that is the life giving gas on this planet. Pollution, global warming, and the greenhouse effect change the environment rapidly, ultimately affecting flora and fauna. The only way to manage these issues is to understand and protect the environment. Planting and preserving trees is our natural environment, as trees not only supply us with oxygen, but also remove harmful gases from the atmosphere, especially CO₂ gas, which is a major concern for global warming. Is one of the ways to protect. Now is the time to educate people about climate change, and keeping tree records is one of those steps. Tree records include getting the exact location of trees, giving people knowledge about different tree species. It encourages people to understand the importance of trees and to have knowledge of the different forms of trees. Plan future needs and assess different aspects of urban forest management [11].

Record retaining structures can be easy or intricate. Tree packages with some confined dreams would require a confined wide variety of statistics to assess their success. On the alternative hand, complete tree packages can also additionally want to maintain extra special statistics, and a extra sizable report control machine can be needed. Comprehensive tree stock structures can offer a wealth of records approximately the city woodland and municipal tree care operations [12,13].

However, extra statistics are usually required to cowl factors of the tree control software which include long time period planning, public education, ordinance enforcement, and software administration. For example, tabulations of tree associated permits, ordinance violations, and enforcement movements can be had to check the implementation of positive tree ordinance provisions. Disadvantages of conventional techniques are inaccuracy, sign and battery failure, time consuming and costly [14].

Today is a fast growing digital world with 60 million smart phone users in India alone. Therefore it is possible to create such records with ease. Through this paper the authors have attempted to discuss on low cost approach that was tested and implemented for such a cause.

II. LITERATURE REVIEW

A GIS based method for finding potential plantations and modifications based on land cover data is presented. This study presents a program for urban green space development by GIS based soil compatibility analysis: Quantification of green space based on micro compatibility [13,15]. Computer programs have been developed to create and classify various maps such as digitization, roads, buildings, green spaces, and tree maps. Existing trees are physically documented using GPS (height, width, plant name, common name, etc.) and the data from them is evaluated using the

Microsoft Excel application. GPS, or Global Positioning System, is a global navigation satellite system that provides position, velocity, and time synchronization. In general, you can choose from three categories of GPS hardware. These are wireless built-in and wearable receivers. The type of software used by GPS can be purchased from a store and installed on your device, or downloaded directly from the Internet to your computer or device. There are different types of GPS technology [16,17]. The details are as follows.

A Differential Global Positioning System (DGPS) is an enhancement to the Global Positioning System (GPS) which provides improved location accuracy, in the range of operations of each system, from the 15 meter nominal GPS accuracy to about 1–3 cm in case of the best implementations. RTK is an abbreviation for Real Time Kinematics. RTK-enabled GPS receivers capture normal signals and correction currents from global navigation satellite systems to achieve 1 cm of position accuracy. Wide Area Reinforcement System (WAAS) is an air navigation support device developed by the Federal Aviation Administration for the use of Global Positioning System (GPS). To improve its accuracy, integrity, and availability. In essence, WAAS is designed to allow an aircraft to rely on GPS at all stages of its flight, including an accurate approach to the airport within its coverage area. It can be used with the local area expansion system "LAAS". It will be further improved. It is also known as the Ground Based Augmentation System "GBAS", which is the recommended term of ICAO in critical areas. There are several versatile applications where GNSS is extremely useful. For example from surveying and mapping to space, military, marine, mining and agriculture [18,19,20].

SURVEYING AND MAPPING: The surveying and mapping industry was one of the first to adopt GPS because it dramatically increased productivity and provided more accurate and reliable data. Today, GPS is an integral part of surveying and mapping activities around the world. When used by experienced professionals, GPS provides the most accurate survey and mapping data. GPS-based data acquisition is much faster than traditional surveying and mapping techniques, reducing the amount of equipment and effort required. Now a single surveyor can do what the entire team took weeks in a day.

SPACE: GPS from manned vehicle guidance systems to communications satellites management, tracking, control, and space surveillance of the Earth, is revolutionizing and activating the way nations operate in space. Navigation, Posture and timing are the three main advantages of using GPS. Navigation solution uses existing space-grade GPS units to provide accurate orbit determination and minimal ground control crew. Posture solution replaces expensive in-vehicle posture sensors with multiple cost effective GPS antennas and specialized algorithms. Timing solution replaces an expensive spacecraft atomic clock with a cost effective and accurate time GPS receiver.

MILITARY: The first GNSS systems (GPS and GLONASS) were developed for military purposes, but only later in the development of these systems it was decided to open them up for civilian purposes as well. Military applications are still one of the driving forces of these systems today. GPS was designed and built for the military. GPS is widely used in spacecraft. GPS flew on several shuttle missions has proven to help provide better orbital positioning in much less time than before. Incorporation of GPS altitude determination in space station design is currently mandated.

HEAVY VEHICLE GUIDANCE: GPS is also used in heavy duty trucks used in mining and construction. For example, in road construction, marker pegs and surveyors have been replaced by instant in-vehicle vehicle guidance and control systems. This makes the job easier because the driver only has to follow the surveyor's pre-programmed site plan. Therefore, designers can use this app to achieve tight tolerances for position, tilt, and level.

MARINE: Boat captains need a very accurate navigation app to be able to navigate through the body of water to their destination. These applications ensure that the channels are clear and that there are no obstacles that could interfere with navigation. These are also needed in the Navy sector as they are used for charting and placement of dredging operations on rivers, sandbars and piers to ensure that other boats travel deeper.

AGRICULTURE: The development and implementation of precision agriculture or site specific agriculture was achieved by a combination of GPS and Geographic Information Systems (GIS). These technologies combine real time data acquisition with accurate location information to efficiently process and analyse large amounts of geospatial data. GPS based applications in precision agriculture are used for farm planning, field mapping, soil sampling, tractor guidance, crop exploration, floating rate applications, and yield mapping. GPS allows farmers to work in poor visibility conditions such as rain, dust, fog and darkness.

III. MATERIAL AND METHODS

The objective of this study is to collect coordinates of tree showing the location of trees and mapping the trees in the college campus using mobile based GPS. In the first phase of our work we collect the data using GPS waypoints application installed on an Android mobile phone. The GPS Way Points App is a multi purpose mapping and surveying tool for both professional and personal use Its use was reported previously by the authors in [21] to map land and soil properties. Being a low cost device, the accuracy is up to 3 m horizontally. However the accuracy in the vertical direction was inconclusive. The tool could be valuable in several professional land based surveying activities,

including agriculture, forest management, infrastructure maintenance (e.g. roads and electrical networks), urban planning & real estate and emergencies mapping, but only when depth (altitude) is not a very important parameter. The most advantage of this tool is its access on Smartphone devices, therefore being affordable to millions of users in India [22] and in abroad as well. It is also used for personal outdoor activities, such as hiking, running, walking, travelling and geo caching. The application uses the internal GPS receiver from the mobile device (typically with accuracies > 3 m) or, alternatively, allows professional users attaining better accuracies with a Bluetooth external GNSS receiver compatible with NMEA stream format (e.g. RTK receivers with centimetre level precision). For that we used Samsung A30s mobile phone with Android Pie 9.0 operating system and Exynos 7904 processor. The specifications of the smart phone are shown in Figures 2a–d. Figures 3a– 3d shows the display windows of the GPS Way point app. Figure 4 shows the flowchart of data flow and process.

For this project three types of data (coordinates) we collect. Longitude, Latitude and Altitude of each tree. In second phase we proceed the collected data by tabulating it. Then we form proper green map for it. We worked with 93 trees of different species in front of the college campus (as illustrated in Figure 1). First we downloaded the GPS Waypoint app in our android mobile phone. Then select the place surrounding the main building of college campus where we do mapping of trees. Open GPS waypoints app on our Smartphone and wait for some minutes to get more accuracy less than 3 meters. We hold our Smartphone close to tree to get accurate coordinates (Longitude, Latitude and Altitude) of trees. We collect all the information about the location of trees then note down on the paper. Then transferred this data to Excel sheet and form a table with the parameters like name of tree, longitude, latitude, altitude, scientific name and family of tree. All the trees surrounding office and laboratory buildings were catalogued along with their attributes. Coordinates (latitude: longitude: altitude) of each tree were measured with the help of GPS Waypoints mobile application.



Figure 1. Google earth image (Map) of the study area (site).



Figure 2a. Image of mobile phone device used for mapping

NETWORK	
Technology	GSM / HSPA / LTE
2G bands	GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (dual-SIM model only)
3G bands	HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100
4G bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 28, 38, 40, 41, 66
Speed	HSPA 42.2/5.76 Mbps, LTE-A
LAUNCH	
Announced	2019, August 22
Status	Available Released 2019, September 11
BODY	
Dimensions	158.5 x 74.7 x 7.8 mm (6.24 x 2.94 x 0.31 in)
Weight	169 g (5.96 oz)
Build	Glass front, plastic back, plastic frame
SIM	Single SIM (Nano-SIM) or Dual SIM (Nano-SIM, dual stand-by)
DISPLAY	
Type	Super AMOLED
Size	6.4 inches, 100.5 cm ² (~84.9% screen-to-body ratio)
Resolution	720 x 1560 pixels, 19.5:9 ratio (~268 ppi density)
PLATFORM	
OS	Android 9.0 (Pie), upgradable to Android 11, One UI 3.1
Chipset	Exynos 7904 (14 nm)
CPU	Octa-core (2x1.8 GHz Cortex-A73 & 6x1.6 GHz Cortex-A53)
GPU	Mali-G71 MP2

Figure 2b. Image showing general specification of smart phone device used in this study

8:50 96%	
MEMORY	
Card slot	microSDXC (dedicated slot)
Internal	32GB 3GB RAM, 64GB 4GB RAM, 128GB 4GB RAM eMMC 5.1
MAIN CAMERA	
Triple	25 MP, f/1.7, 27mm (wide), PDAF 8 MP, f/2.2, 13mm (ultrawide), 1/4.0", 1.12µm 5 MP, f/2.2, (depth)
Features	LED flash, panorama, HDR
Video	1080p@30fps
SELFIE CAMERA	
Single	16 MP, f/2.0, 26mm (wide), 1/3.06", 1.0µm
Video	1080p@30fps
SOUND	
Loudspeaker	Yes
3.5mm jack	Yes
COMMS	
WLAN	Wi-Fi 802.11 a/b/g/n/ac, dual-band, Wi-Fi Direct, hotspot
Bluetooth	5.0, A2DP, LE
GPS	Yes, with A-GPS, GLONASS, GALILEO, BDS
NFC	Yes (market/region dependent)
Radio	FM radio
USB	USB Type-C 2.0, USB On-The-Go
FEATURES	
Sensors	Fingerprint (under display, optical), accelerometer, gyro, proximity, compass
Messaging	SMS(threaded view), MMS, Email, Push Email, IM
Browser	HTML5
BATTERY	
Type	Li-Po 4000 mAh, non-removable
Charging	Fast charging 15W

Figure 2c. Image showing technical specification of smart phone device used in this study

Display Features	
Display Size	16.26 cm (6.4 inch)
Resolution	1920 x 1080 Pixels
Resolution Type	HD+
GPU	ARM Mali-G71 MP2
Display Type	Super Amoled V Cut Display
Display Colors	16M
Os & Processor Features	
Operating System	Android Pie 9.0
Processor Type	Exynos 7904
Processor Core	Octa Core
Primary Clock Speed	1.8 GHz
Secondary Clock Speed	1.6 GHz

Figure 2d. Image showing technical specification of smart phone device used in this study

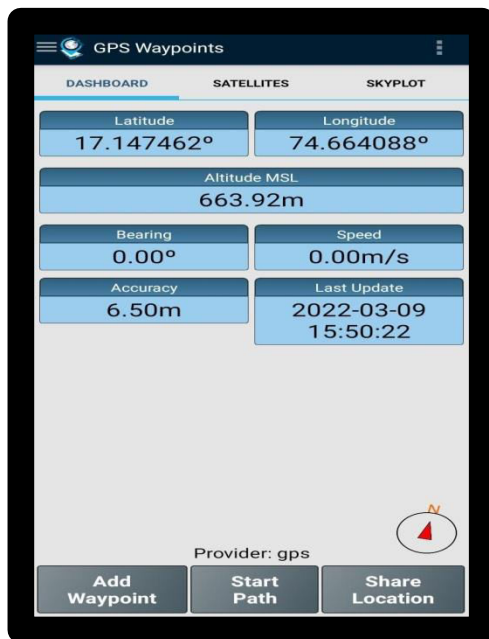


Figure 3a. Images showing the geo coordinates in GPS Waypoints

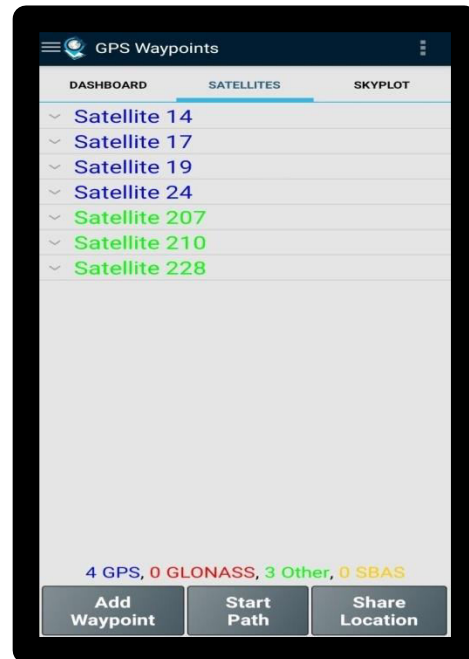


Figure 3b. Images showing the GNSS satellites in GPS Waypoints



Figure 3c. Images showing the skyplot in GPS Waypoints

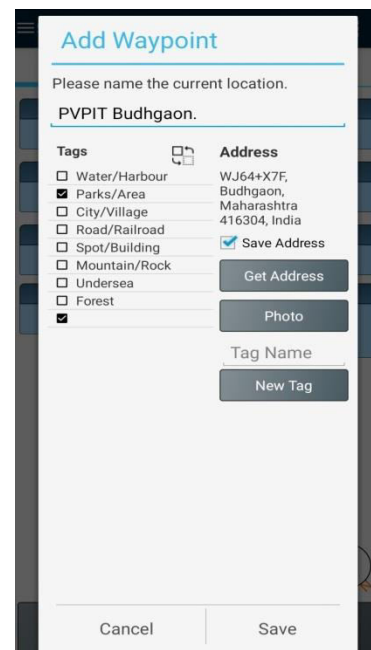


Figure 3d. Image showing the data saving options (parameters)

IV. EXPERIMENTAL RESULTS

Figures Tree species in college Campus during the course of investigation 93 trees that belonged to different species were catalogued. The cataloguing refers to the trees species presently existing on the road side, surroundings of college campus and on green area. From this study, we can also explore the possibility of identifying the gaps in the plantations and also identify open areas that are suitable for re plantation. As and when there is tree damage in the

campus either we must replace the tree with the same plant species or if needed native trees must be considered that have good canopy and better living index for the human being.

After discussing with an Botanical expert it was found that, out of 93 trees pimple (*Ficus religiosa*) belongs to Moraceae family, Nilgiri (*Eucalyptus globulus*) belongs to Myrtaceae family, Sankeshwar (*Caesalpinia pulcherrima*) belongs to Fabaceae family, Indian Devil Tree (*Alstonia scholaris*) belongs to Apocynaceae family, Ashok (*Polyalthia longifolia*) belongs to Annonaceae family, Coconut (*Cocos nucifera*) belongs to Arecaceae family, Teak (*Tectona grandis*) belongs to Lamiaceae family, Limb (*Azadirachta indica*) belongs to Meliaceae family, also there are unidentified species, A tree catalogue system was developed to enhance public understanding of trees. To understand the structure of the land cover on campus, this study used Geographic Information System (GIS) software to classify and compare land cover. A green map that is generated during the investigations indicated that the map provides the information regarding the green cover in the campus.

Table 1. Sampled trees mapped in study area using GPS Way points.

Name of tree (Common Name)	Latitude	Longitude	Altitude	Name given to the tree	Tree species (Botanical name)	Family
Nilgiri	16.911593	74.605284	572.83	N1	<i>Eucalyptus globulus</i>	Myrtaceae
Nilgiri	16.911621	74.605302	572.83	N2	<i>Eucalyptus globulus</i>	Myrtaceae
Nilgiri	16.911698	74.605383	574.83	N3	<i>Eucalyptus globulus</i>	Myrtaceae
Nilgiri	16.9117	74.605398	574.83	N4	<i>Eucalyptus globulus</i>	Myrtaceae
Nilgiri	16.911797	74.605483	574.83	N5	<i>Eucalyptus globulus</i>	Myrtaceae
Sankeshwar	16.911844	74.605526	573.83	S1	<i>Caesalpinia pulcherrima</i>	Fabaceae
Nilgiri	16.911853	74.605551	573.83	N6	<i>Eucalyptus globulus</i>	Myrtaceae
Nilgiri	16.911864	74.605564	573.83	N7	<i>Eucalyptus globulus</i>	Myrtaceae
Sankeshwar	16.911864	74.605564	573.83	S2	<i>Caesalpinia pulcherrima</i>	Fabaceae
Nilgiri	16.911882	74.605589	575.83	N8	<i>Eucalyptus globulus</i>	Myrtaceae
Sankeshwar	16.911927	74.605633	577.83	S3	<i>Caesalpinia pulcherrima</i>	Fabaceae
Nilgiri	16.911935	74.605645	576.83	N9	<i>Eucalyptus globulus</i>	Myrtaceae
Sankeshwar	16.911952	74.60567	576.83	S4	<i>Caesalpinia pulcherrima</i>	Fabaceae
Nilgiri	16.911973	74.605682	575.83	N10	<i>Eucalyptus globulus</i>	Myrtaceae
Sankeshwar	16.912	74.605702	574.83	S5	<i>Caesalpinia pulcherrima</i>	Fabaceae
Sankeshwar	16.912037	74.605756	575.83	S6	<i>Caesalpinia pulcherrima</i>	Fabaceae
Unknown	16.91209	74.605825	574.83	-	-	-
Sankeshwar	16.912167	74.605885	574.83	S7	<i>Caesalpinia pulcherrima</i>	Fabaceae
Nilgiri	16.912168	74.605885	573.83	N11	<i>Eucalyptus globulus</i>	Myrtaceae
Sankeshwar	16.912197	74.605908	574.83	S8	<i>Caesalpinia pulcherrima</i>	Fabaceae

Nilgiri	16.91229	74.606016	573.83	N12	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912308	74.606023	572.83	N13	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912335	74.606028	572.83	N14	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912355	74.606045	573.83	N15	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912372	74.60607	574.83	N16	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912376	74.606074	575.83	N17	Eucalyptus globulus	Myrtaceae
Sankeshwar	16.912392	74.606107	579.83	S9	Caesalpinia pulcherrima	Fabaceae
Nilgiri	16.912407	74.606117	577.83	N18	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912444	74.606138	574.83	N19	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912441	74.606154	574.83	N20	Eucalyptus globulus	Myrtaceae
unknown	16.912452	74.606148	574.83	UKN		
Nilgiri	16.91249	74.606186	573.83	N21	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912519	74.606213	574.83	N22	Eucalyptus globulus	Myrtaceae
Nilgiri	16.912632	74.606333	575.83	N23	Eucalyptus globulus	Myrtaceae
Indian Devil Tree	16.912403	74.605789	574.83	ID1	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912383	74.605727	575.83	ID2	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912354	74.605695	574.83	ID3	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912334	74.605689	574.83	ID4	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912309	74.605655	574.38	ID5	Alstonia scholaris	Apocynaceae
Limb	16.912257	74.605678	575.83	L1	Azadiracta indica	Meliaceae
Indian Devil Tree	16.912263	74.605641	573.83	ID6	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912224	74.605599	573.83	ID7	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912201	74.605562	573.83	ID8	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912158	74.60554	573.83	ID9	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912131	74.605507	573.83	ID10	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912076	74.605445	572.83	ID11	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912056	74.605413	575.83	ID12	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.912017	74.60538	574.83	ID13	Alstonia scholaris	Apocynaceae
Indian Devil	16.91199	74.605357	573.83	ID14	Alstonia	Apocynaceae

Tree					scholaris	
Indian Devil Tree	16.911958	74.60532	573.83	ID15	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.911917	74.605285	573.83	ID16	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.911885	74.605231	572.83	ID17	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.911842	74.605205	572.83	ID18	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.911819	74.605189	572.83	ID19	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.911787	74.605161	572.83	ID20	Alstonia scholaris	Apocynaceae
Indian Devil Tree	16.911745	74.605124	574.83	ID21	Alstonia scholaris	Apocynaceae
Ashok	16.911652	74.60503	575.83	A1	Polyalthia Longifolia	Annonaceae
Ashok	16.911615	74.60507	576.83	A2	Polyalthia Longifolia	Annonaceae
Coconut	16.911592	74.605083	575.83	C1	Cocos nucifera	Arecaceae
Ashok	16.911581	74.605097	575.83	A3	Polyalthia Longifolia	Annonaceae
Sankeshwar	16.911565	74.605106	577.83	S10	Caesalpinia pulcherrima	Fabaceae
Teak	16.912052	74.604846	585.83	T1	Tectona grandis	Lamiaceae
Teak	16.912079	74.604862	586.83	T2	Tectona grandis	Lamiaceae
Teak	16.912074	74.604862	585.83	T3	Tectona grandis	Lamiaceae
unknown	16.912095	74.604921	584.83	UKN		
Teak	16.912133	74.60493	583.83	T4	Tectona grandis	Lamiaceae
Teak	16.912164	74.604942	583.83	T5	Tectona grandis	Lamiaceae
Ashok	16.912204	74.604914	582.83	A4	Polyalthia Longifolia	Annonaceae
Limb	16.912212	74.604903	581.83	L2	Azadiracta indica	Meliaceae
Limb	16.912157	74.604921	584.83	L3	Azadiracta indica	Meliaceae
Ashok	16.912126	74.604921	587.83	A5	Polyalthia Longifolia	Annonaceae
Limb	16.912097	74.604921	587.83	L4	Azadiracta indica	Meliaceae
Limb	16.912079	74.604911	586.83	L5	Azadiracta indica	Meliaceae
Ashok	16.912044	74.604893	584.83	A6	Polyalthia Longifolia	Annonaceae
Indian Devil Tree	16.912039	74.604824	578.83	ID22	Alstonia scholaris	Apocynaceae
Coconut	16.912027	74.60482	580.83	C2	Cocos nucifera	Arecaceae
Unknown	16.91204	74.604795	577.83	UKN	-	-
Coconut	16.912024	74.604789	577.83	C3	Cocos nucifera	Arecaceae
Coconut	16.912033	74.604733	578.83	C4	Cocos nucifera	Arecaceae
Unknown	16.91206	74.604736	577.83	UKN	-	-
Coconut	16.912041	74.604714	579.83	C5	Cocos nucifera	Arecaceae
Coddle	16.912053	74.604672	578.83	Cd1	-	-
Coconut	16.912036	74.604653	577.83	C6	Cocos nucifera	Arecaceae
Limb	16.912036	74.604653	577.83	L6	Azadiracta	Meliaceae

					indica	
Coconut	16.91207	74.604576	575.83	C7	Cocos nucifera	Arecaceae
Ashok	16.912086	74.604578	574.83	A7	Polyalthia Longifolia	Annonaceae
Ashok	16.912088	74.604601	574.83	A8	Polyalthia Longifolia	Annonaceae
Ashok	16.912085	74.604636	574.83	A	Polyalthia Longifolia	Annonaceae
Coconut	16.912034	74.604601	575.83	C8	Cocos nucifera	Arecaceae
Coconut	16.911906	74.604561	576.83	C9	Cocos nucifera	Arecaceae
Coconut	16.911876	74.604562	574.83	C10	Cocos nucifera	Arecaceae
Coconut	16.911857	74.604579	577.83	C11	Cocos nucifera	Arecaceae

V. CONCLUSION

In this study a low cost GPS enabled smart phone device and an android based GPS Way point recording application was used. The authors visited 93 tree locations within the PVPIT Budhgaon campus premises and recorded the geo-coordinates along with the tree information. A table using a spreadsheet program was created to illustrate the stationary geo-coordinates (latitude, longitude, and altitude) of the trees along with some more detailed information. For e.g. common name, give name, tree species (botanical name) and the family they belong to, etc. Using the table, it is planned to map the different tree species on Google earth application in future. Using such information it would be possible for the Gardeners and tree keepers to visualise the tree density in their phones as well as it may help them to plan the structure of their tree planting activities in future.

ACKNOWLEDGEMENTS

This project was partially supported by Dr. VPSSM's Padmabhooshan Vasantraodada Patil Institute of Technology Budhgaon, Sangli. Special attention to our institute's visionaries, Late Dr. Vasantraodada Patil & Shri. Vishaldada Prakashbapu Patil (Chairman, Dr.VPSSM) for their support and blessings. Special thanks to Shri. Amit Vijayrao Patil (Trustee, Dr.VPSSM), Shri. Adinath Babu Magdum (Secretary, Dr.VPSSM), Shri. Pratapsing Lacharamsing Rajput (Chairman, Governing Council, PVPIT). Thanks to Principal, Registrar, Dean's, HOD's, Teaching Faculties, Non Teaching (technical and office) Staff Members and Students.

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