

# UV Guardian – Real time UV Monitoring Application in Urban Environment

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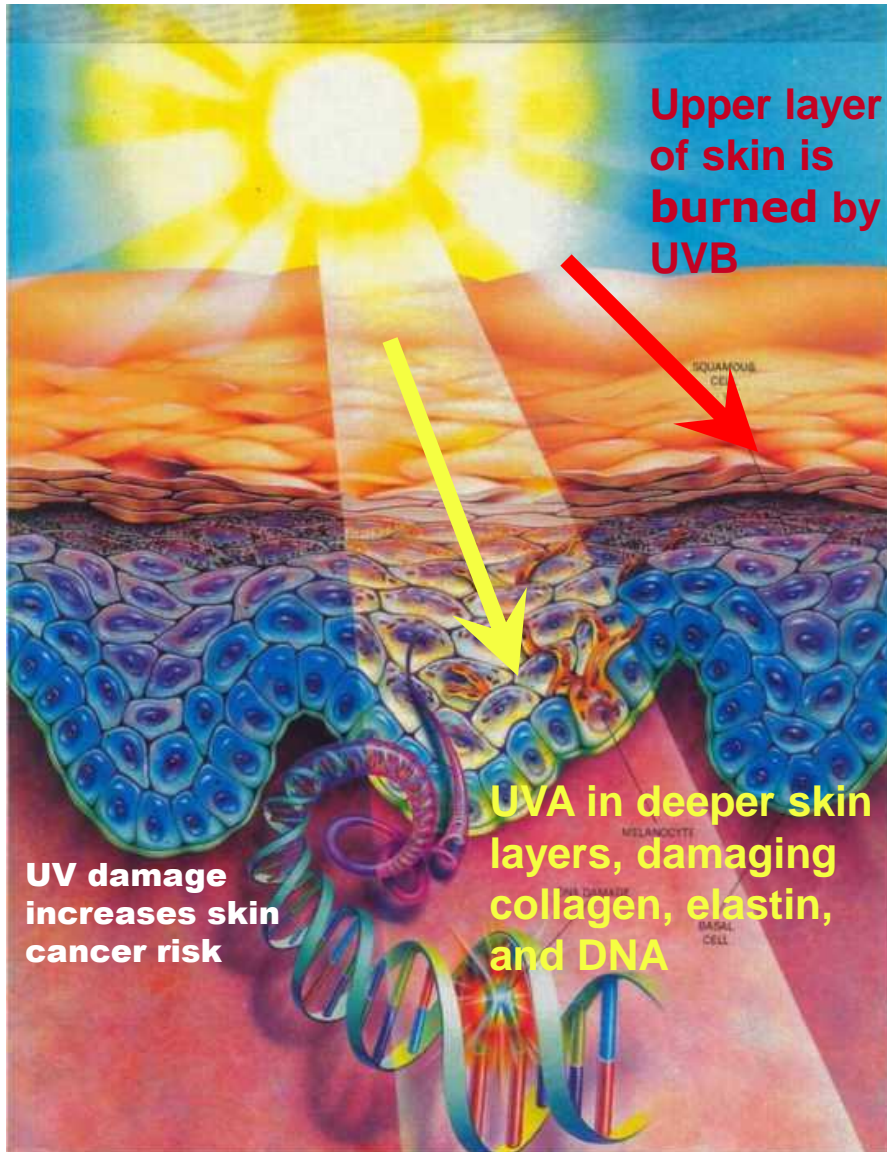
# Why do we need UV Guardian?

- There are about 1.3 million new cases of skin cancer in the U.S. each year, resulting in about 9,800 deaths.
- Melanoma is one type of skin cancer. It is the most common cancer among women between the ages of 25 and 29.
- Skin cancer is the most common of cancers and is largely preventable.
- Increased outdoor leisure time, less clothing worn outdoors, and decreased ozone levels are partly to blame.

# TYPES OF UV RAYS

- **UVA**—causes skin aging & wrinkles. Used in tanning beds. Colors skin and gives false sense of protection from the sun. UVA rays pass effortlessly through the ozone layer.
- **UVB**—causes sunburns, cataracts, immune system damage, skin cancer. Melanoma may be associated with severe UVB sunburns occurring before the age of 20. Most UVB rays are absorbed by the ozone layer.
- **UVC**—these rays are the most dangerous. Fortunately, these rays are blocked by the ozone layer and don't reach the earth.

# How do UVA/UVB rays damage skin?



UVA/B rays make it through our atmosphere

UVB rays cause sunburns.

UVA rays go deeper in the skin and cause wrinkles.

All UV rays damage skin increasing the risk of skin cancer

# UV radiation is not always the same it changes based on...

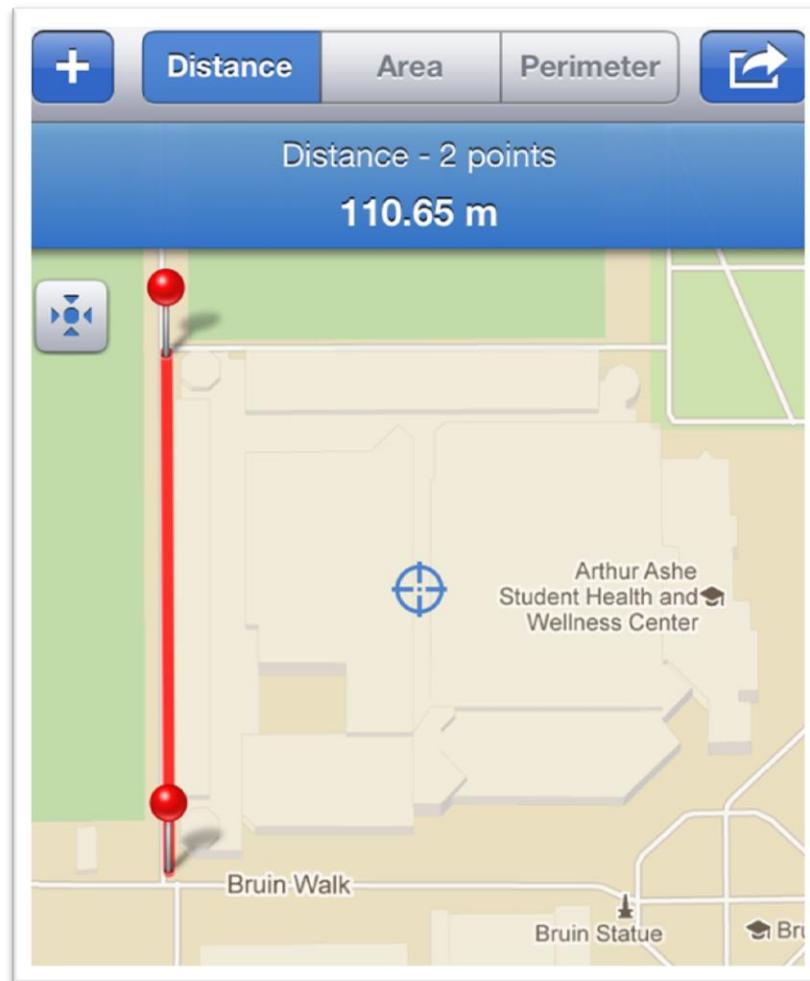
- Time of day
- Time of year
- Location
- Altitude
- Weather
- Reflection
- Ozone Layer



# John wooden Center map- Venue of experiments



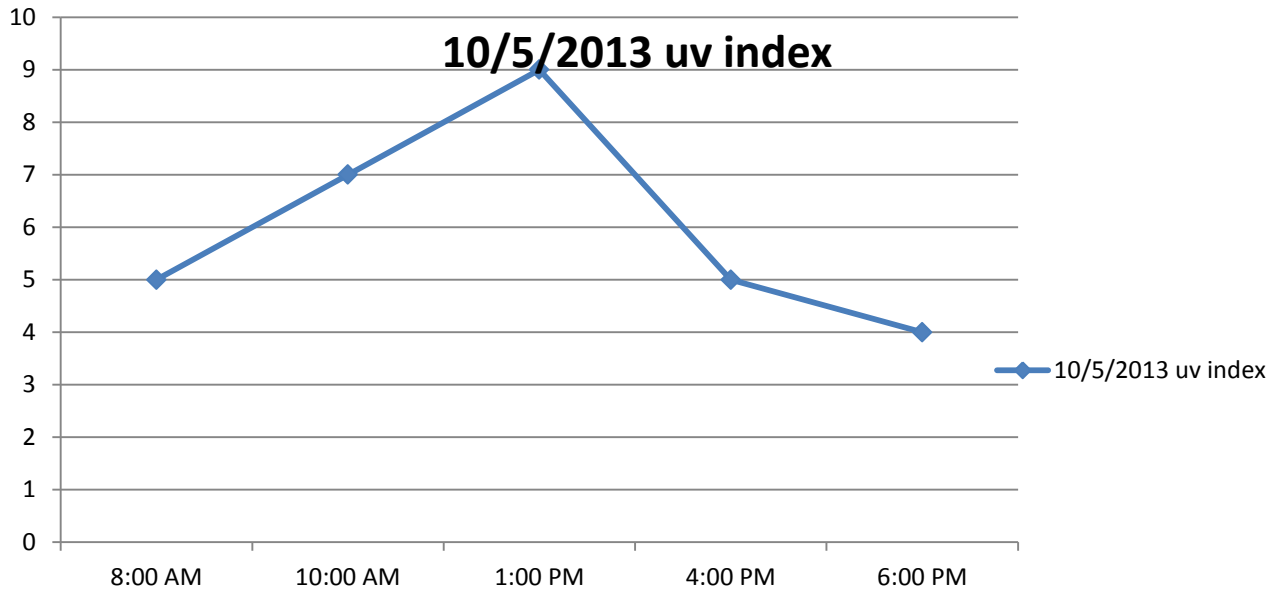
# Measuring the dimensions of JWC



- John wooden center was taken for experiments.
- Has open ground in the surroundings.
- Convenient to measure the effect of shadows.
- Dimensions were made with the path tracking application.



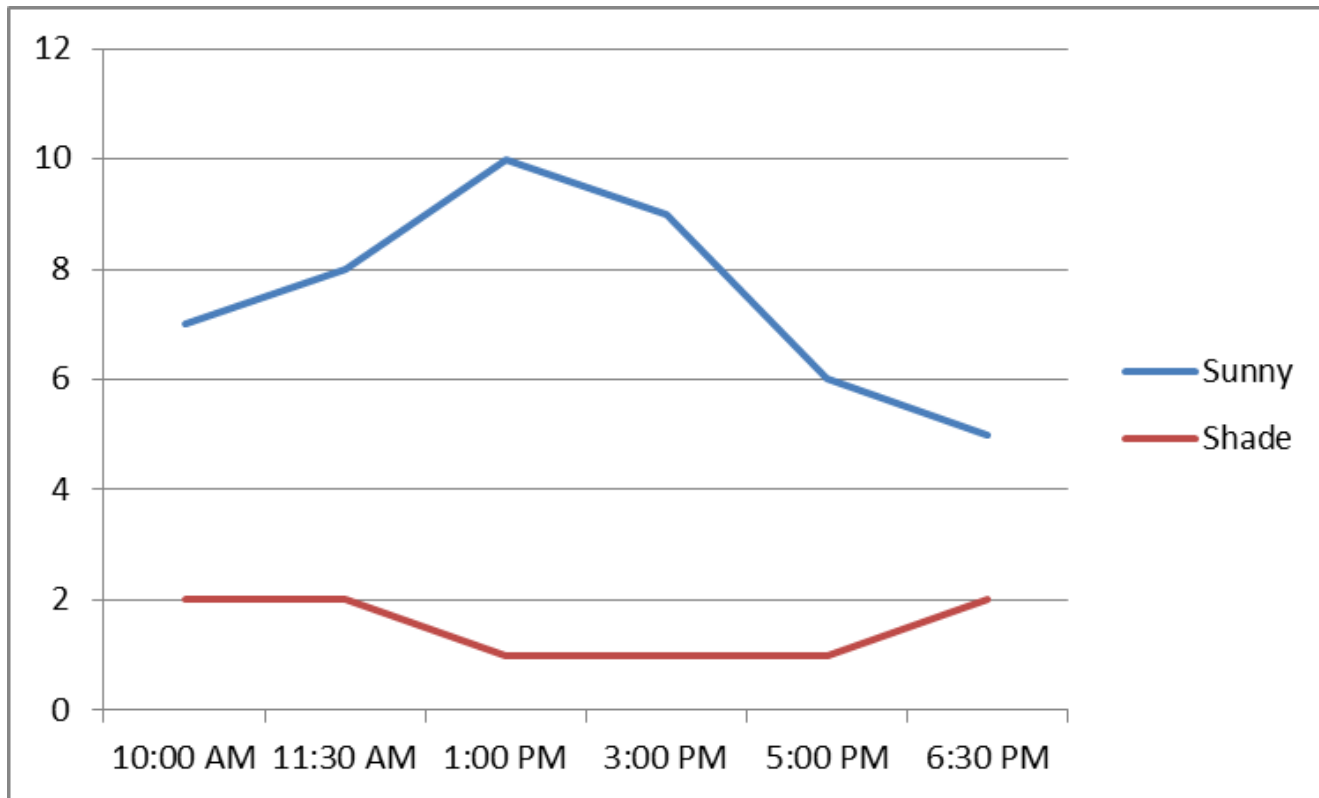
# UV index at Los Angeles



- The curve explains the behavior of UV index.
- The UV index increases as time increases.
- It decreases as time progresses after noon.

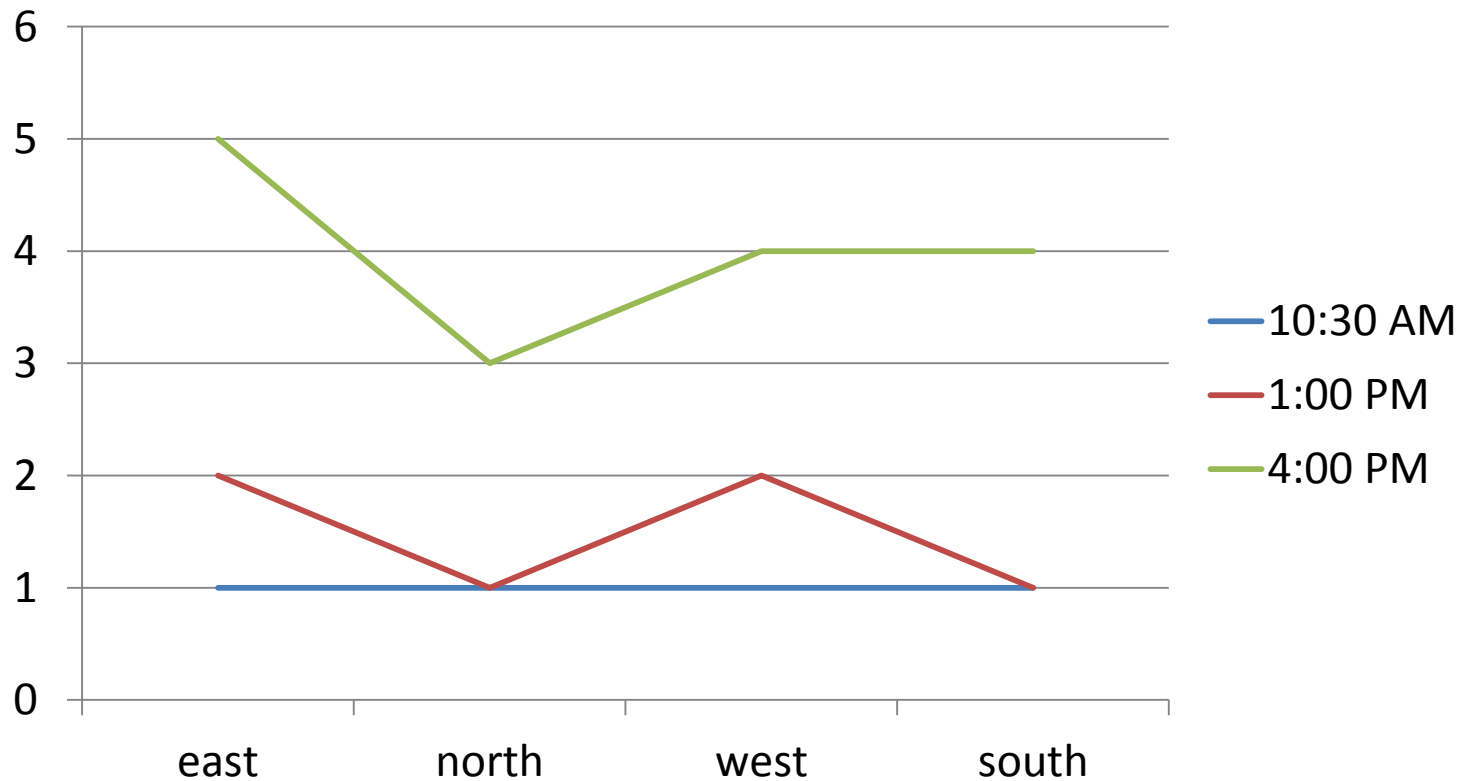
- The sun's light is strongest when it is highest in the sky (normally from 10 AM to 4 PM).
- UV rays are strongest during the summer.
- UV intensity is greater at high altitudes. Skiers need to take extra care.

# Sunny and shade Experiment



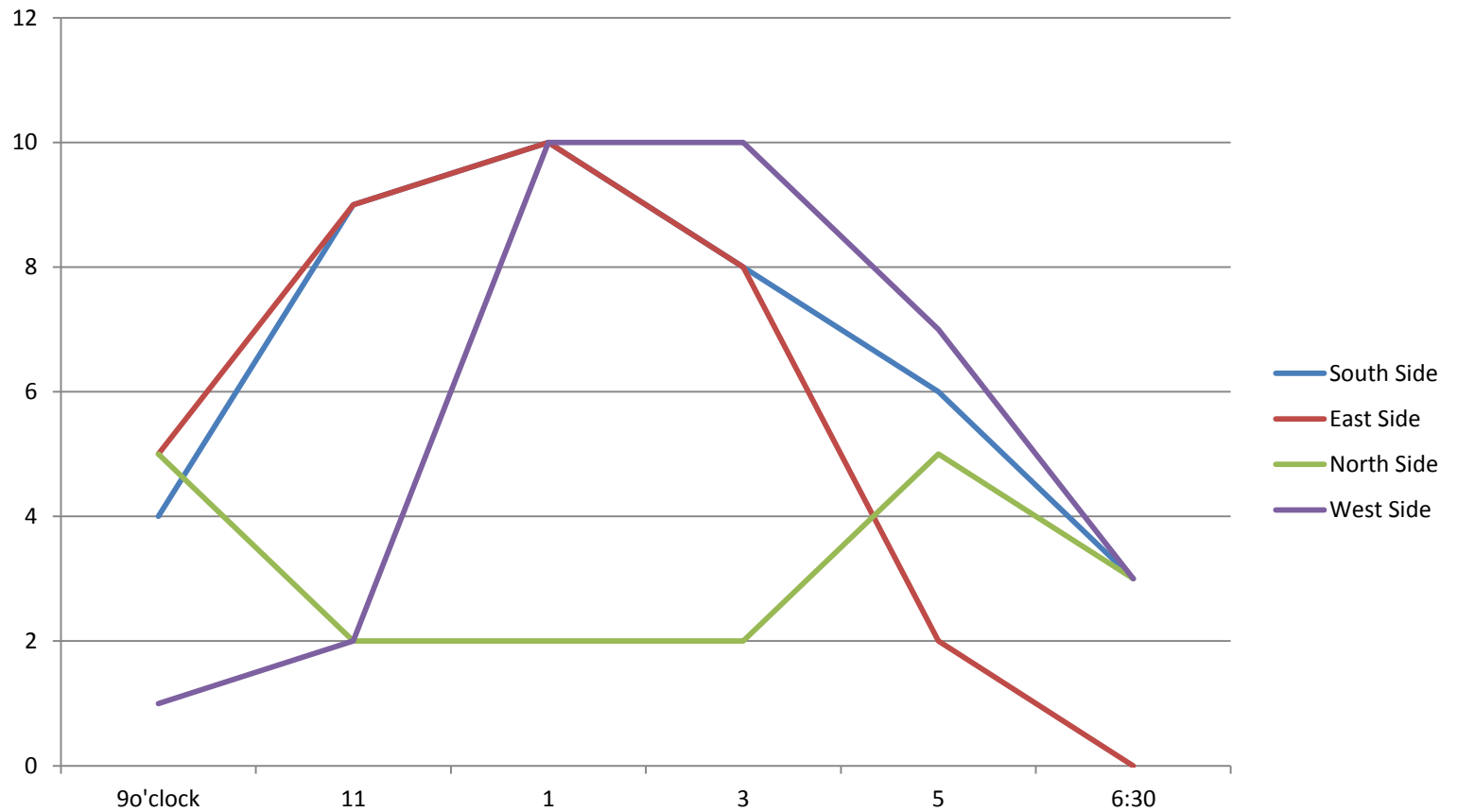
- The experiment is done for different hour of the day from morning till evening.
- We observe that under the shadow of the building the Uv index drops to 2 or 1 irrespective of the value outside.
- The UV index is 0 indoors.

# Cloudy weather



- Even on cloudy, cool, or overcast days, UV rays travel through the clouds and reflect off sand, water, snow, and even concrete.
- Clouds and pollution don't filter out UV rays, and can give a false sense of protection.
- This “invisible sun” can cause unexpected sunburn and skin damage.
- In a cloudy weather, the uv index is expected to be 2 or 1 and even drops to 0.

# JWC Experiment

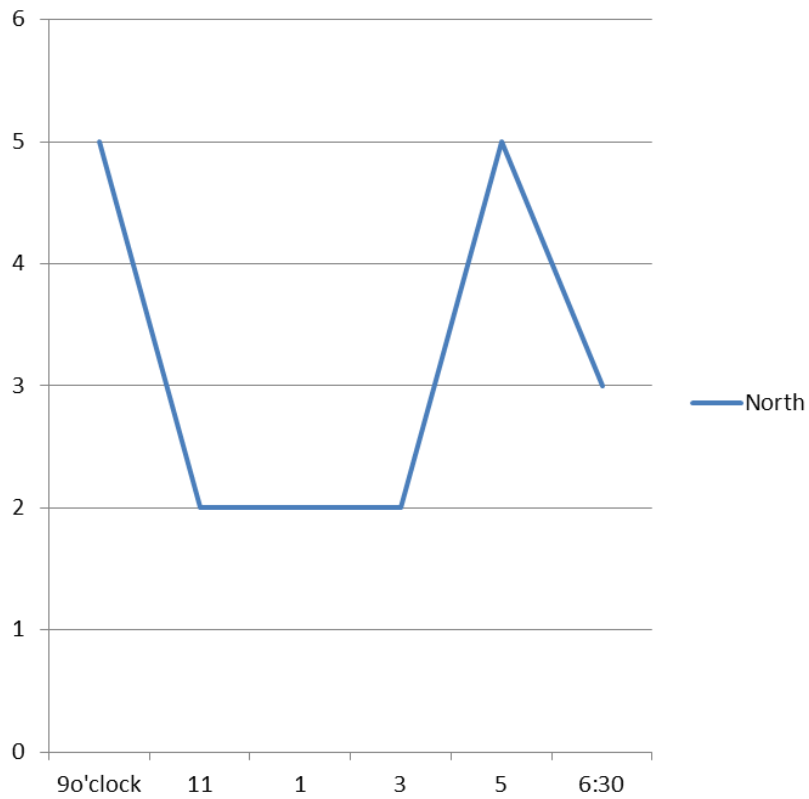


# Effects of shadows

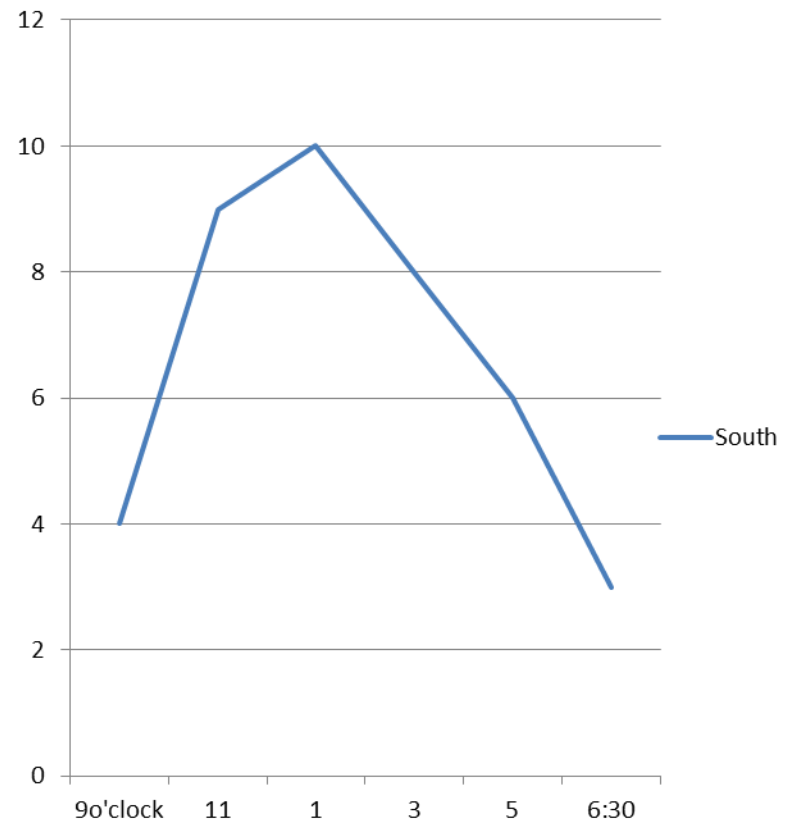
- $h = s * \tan(a)$
- h= Height of the building
- a- azimuth angle of the sun
- s- shadow length
- Shadow length will be more during sunrise and sunset.
- It was observed that the shadow length was more in the morning and evening hours of the day.
- At noon the shadow length is short.



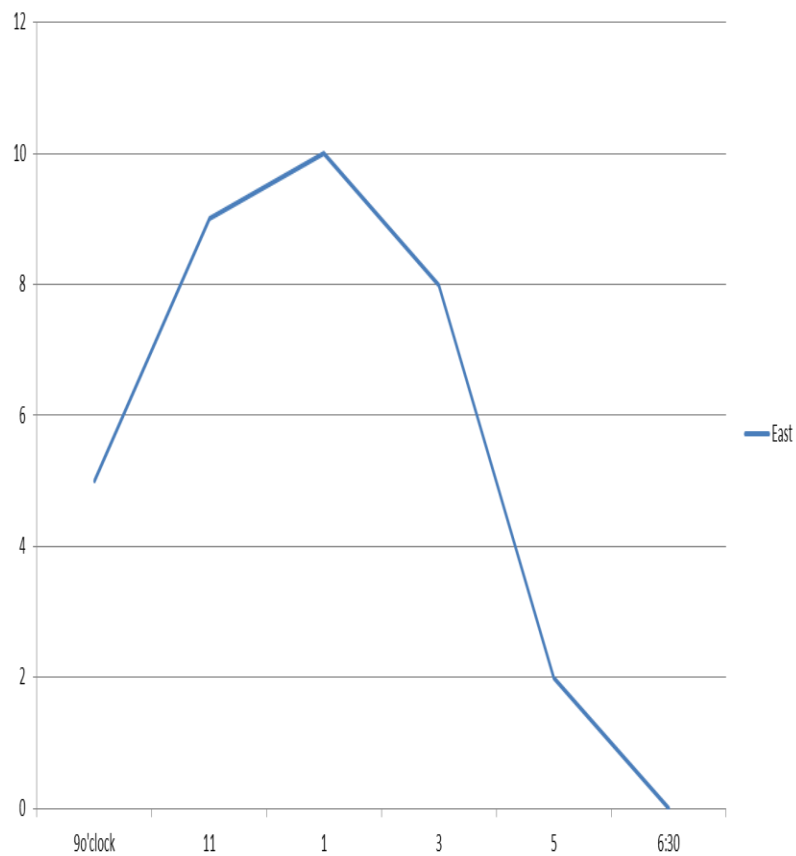
### North



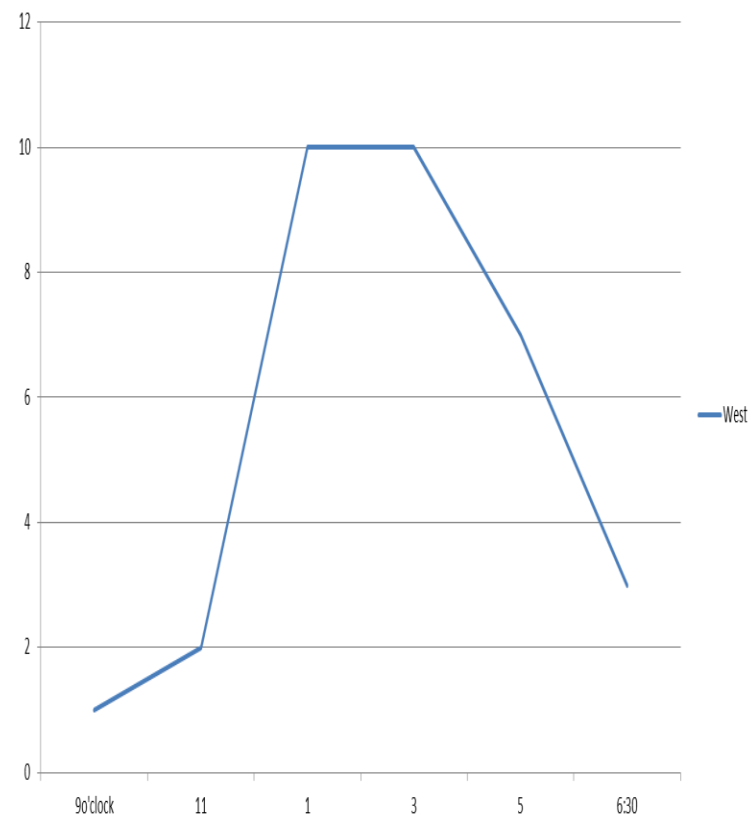
### South



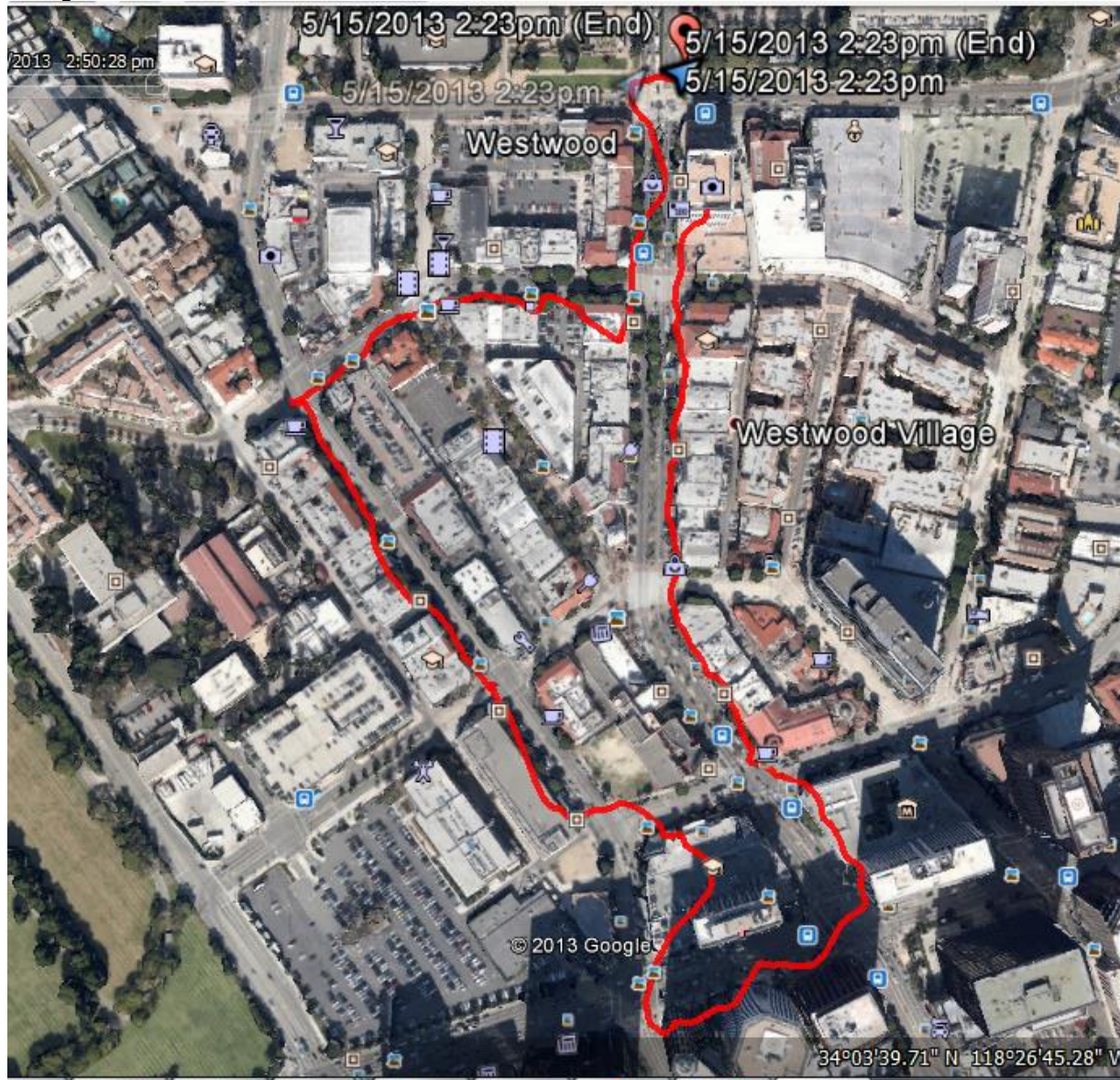
East



West



# Complex Path in Urban environment



# Observations

- UV index – 9
- Distance covered - 1.2 miles
- Cumulative Uv index with shade – 5
- From 15 mins to 27 mins !
- 50% Increase in time

# Year Round Protection

- During winter ( Reflections from snow can double the UV rays from the sun)

- UV radiation is not only associated with heat

Clouds/ Haze- water droplets magnify UV rays.

Latitude- closer to the equator, more potent sun rays.

Altitude- UV radiation increases 4-5% every 1000 ft. above sea level.

Reflection- water, sand, concrete and snow reflect 90% of UV rays.

Photosensitive Reactions- medicines for acne or antibiotics

# Sun Safety Action Steps



**Limit Time in  
the Midday Sun**



**Wear  
Sunglasses**



**Seek Shade**



**Use Sunscreen**



**Cover Up**



**Avoid Tanning  
Parlors**



**Wear a Hat**



**Watch for  
the UV Index**

- Sunscreen doesn't offer 100% protection.
- SPF 30+ sunscreen blocks 96% of UV; SPF 15+ blocks out 93%.
- In addition to sunscreen, wear a hat, sunglasses, more clothing, and seek shade.

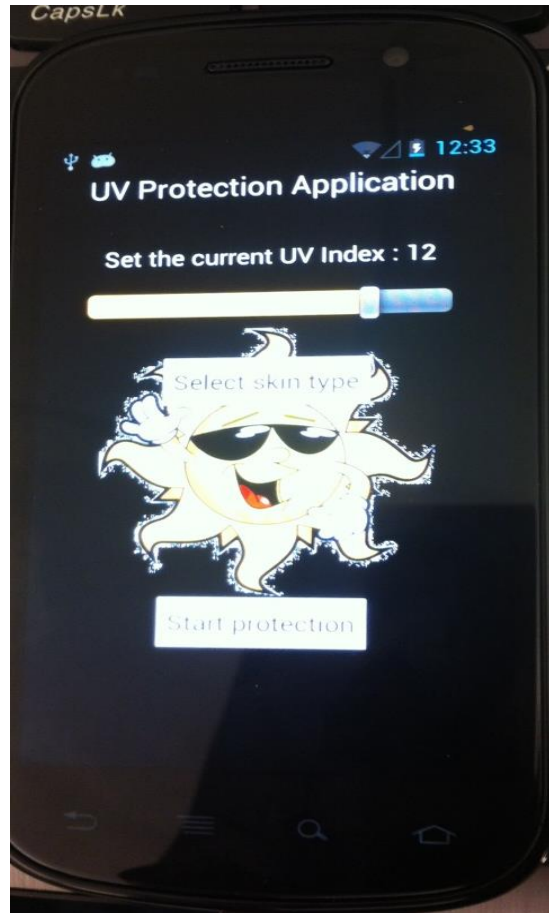
# Ultraviolet Radiation - UV

The UV Index predicts the next day's UV levels on a 0-10+ scale.

UV Index Number	Exposure Level	Minutes to Burn
0 to 2	Minimal	60
3 to 4	Low	45
5 to 6	Moderate	30
7 to 9	High	15
10+	Very high	10

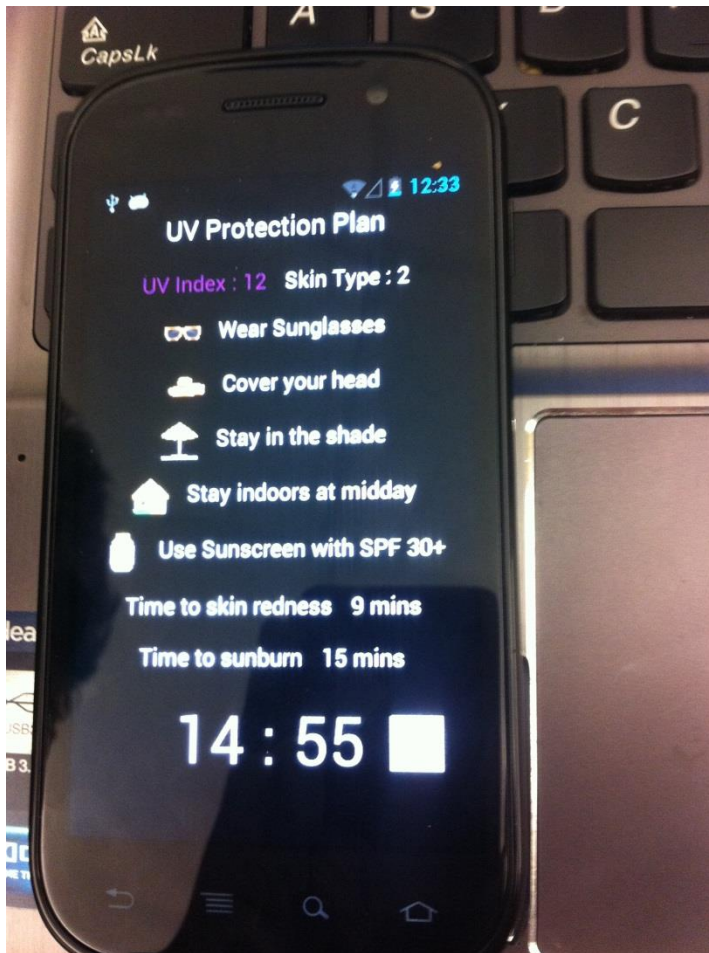


# UV Protection –Android Application



- Input – UV index , Skin type
- Output – Protection measures and time to sun burn.

# UV Protection –Android Application



- The UV protection application is integrated with path tracking feature.
- The path tracking feature tracks the path the user is taking.