# CMPSCI 119
# LAB #5 – Sunrise
# Professor William T. Verts

The goal of this Python programming assignment is to finish the code from the "scroller" assignment to create an animated movie that shows the sun rising up from behind the horizon as night turns to dawn. There are several required parts, but you are encouraged to be creative.  Have some fun with this one!

Study the diagram shown below.    It's also on the class site (in color) at **http://people.cs.umass.edu/~verts/cmpsci119/Sunrise%20Description.gif**:
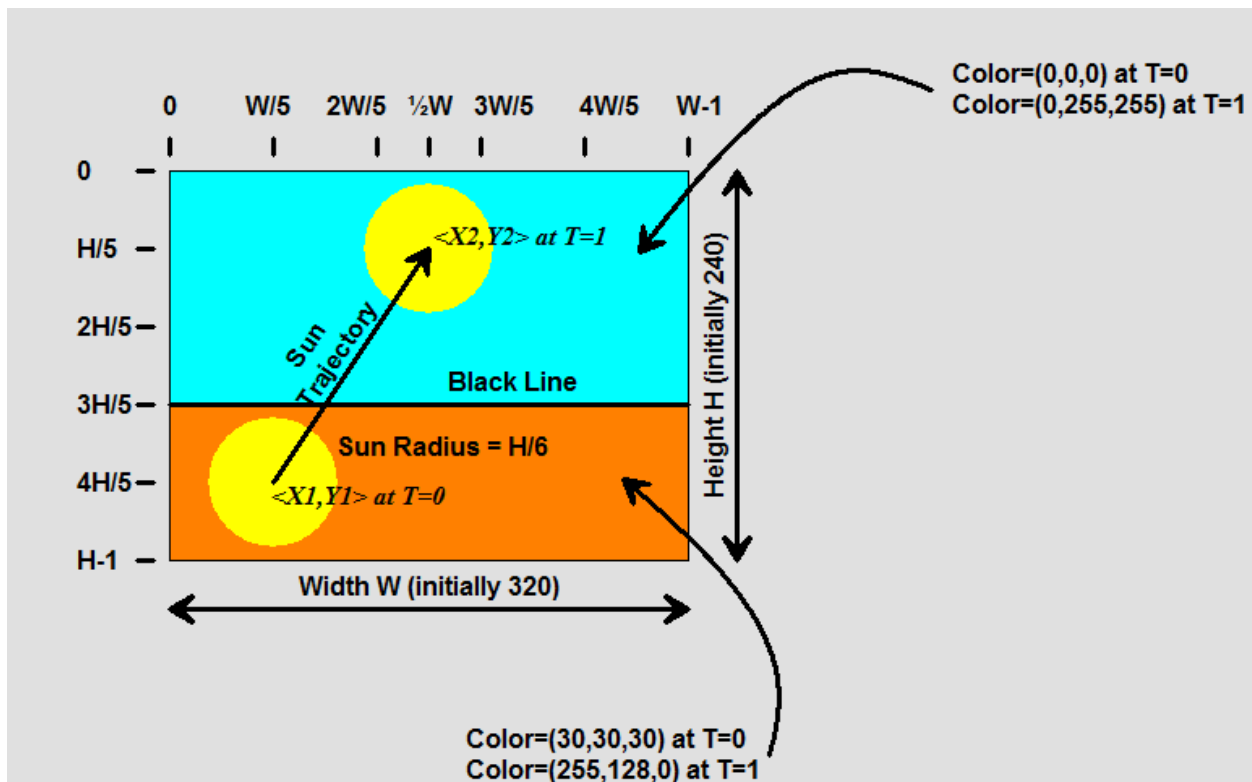


In the diagram shown above each frame is 320×240 pixels, but in the Scroller assignment the size was set to 640×480.  Leave the canvas size at 640×480, but I want to be able to change it and have the animation *play the same way* and *create an identical movie* at any arbitrary size.  Do NOT hard-code numeric constants into your program; pay particular attention to the proportions listed in the diagram (2H/5, ½W, etc.).

## First Steps

Make a copy of your `Lab4.py` program as `Lab5.py` in the same folder.  <u>Do not</u> modify your old `Lab4.py` program. (You should keep it for backup purposes.)

Change the name of the movie in the `writeQuicktime` function from `Scroller.mov` to
***Last_First_Sunrise.mov*** with ***your*** last name and first name (I would use
`Verts_William_Sunrise.mov`, for example).

**Main Task**

In the `Run` function left over from `Scroller` there is an empty function stub called `Sunrise`, which
is called <u>before</u> the `Scroller` function. The parameters to `Sunrise` are the current canvas and the
number of frames to generate for the movie, currently 100 frames. Depending on the complexity of
your animation you are <u>allowed to use more than 100 frames</u>, but the number of frames must be passed
in as a parameter and <u>not</u> hard-coded in the `Sunrise` function. (In other words, you are allowed to
change the function call to `Sunrise(Canvas,200)` or `Sunrise(Canvas,300)`, etc., but those
numbers must <u>not</u> appear explicitly inside the function itself.) For each frame call the `SaveFrame`
function. Finish the code in `Sunrise` to do the following REQUIRED things:

(A)     Cause the sun to come up from behind the ground and horizon line up into the sky. The horizon
        line is a black line at the common edge of the sky and the ground.

(B)     As the sun comes up, the sky must change from <u>black to cyan</u> and the ground from <u>dark gray to
        orange</u> (exact numbers in the diagram).

(C)     Create **AT LEAST TWO** additional objects that ***change color and position*** as the sun comes up.
        These can be a car that drives along the ground (getting brighter as the sun comes up), birds
        that move across the sky, fish swimming, clouds, etc. The objects must change in a logical way
        (i.e., the sun can't be in front of birds or clouds, clouds can't be bright white before the sun
        comes up, etc.).

(D)     You will be given **EXTRA CREDIT** for <u>three or more objects</u>, including multiple items following
        different paths, for example (for example, I suggest a function that paints a car, its wheels and
        windows, at a given location and color, or the `FishLeft` and `FishRight` functions from the
        Fish Tank assignment, a 3D house, or something of your own design). You will also acquire
        EXTRA CREDIT for use of <u>parabolic, quadratic spline, or Bézier blending functions</u> for trajectories
        and/or colors, <u>polygon fill</u>, and/or use of 3D projection to generate <u>3D objects</u> in your scene.

The code to do 3D orthographic projections, polygon fill, linear and parabolic blending, etc., is available
on the class site or in the Companion – you can use any code that you need from those examples.

Use the `Run` function to start up the program. It should create a bunch of frames as individual `.jpg`
files, some from the `Sunrise` function and some from the `Scroller` function (make certain that the
frames generated here do not conflict with those generated from the previous assignment). Once the
frames have been created, use the `MakeMovie` function to create a movie from your frames and save
it out to the disk as either an Apple Quicktime movie (recommended) or as a Windows AVI movie.

**Finishing Up**

When all steps are complete, AND YOUR PROGRAM RUNS, submit your code through the on-line form as
Lab #5. DO NOT submit the program until you can correctly create a movie <u>file</u> with sunrise <u>and</u> credits.