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COMP 175
Spring 2015

A3: Sceneview
Algo Worksheet

Due Wed. 3/25/15

Part 2) Commands appear in the following order:

i)
```
glMatrixMode(GL_MODELVIEW)
glLoadMatrix()
glBegin()
glVertex4fv()
glEnd()
```

ii) If "glLoadMatrix" appeared between "glBegin" and "glEnd," the above code would throw an error and would not work. There are only fourteen valid commands that can appear between an "glBegin" and a "glEnd," all others are ignored (per "glBegin" man page.)

Effectively, only things like vertices, lines, colors etc go in this block (where the actual "drawing" occurs), the transformation matrix must be defined before any drawing occurs.

3) i) $C' = T^{-1} * R * S * T * C$

ii) $CTM = CTM1 * CTM2$

↑ The inner matrix is applied first to the sphere

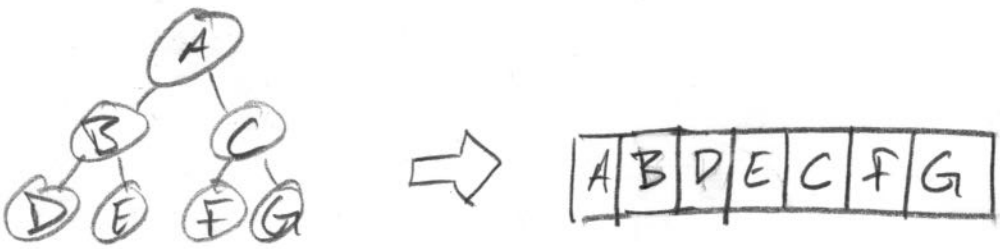
then the outer matrix

i.e. a vertex V transforms into V':

$$V' = (CTM1 * CTM2) * V$$

4) i) A maximally efficient program would traverse the parse tree with a depth first search. As such, it processes each node only once. Counting when we have to back-track back up the tree, we can say we touch every node no more than twice.

ii) We can flatten the parse tree into an array which simulates a depth first search: every node is immediately followed by its children, grandchildren etc. Consider:



iii) Information for each node:

```
node* parent; // ptr to parent
node** children; // ptr to array of children
int num_children; // number of children
Matrix CTM; // transform separating this node from its parent
int ind; // in a flattened tree, would be helpful to store
         // the index of a node
```