

# KEEL™ (“Knowledge Enhanced Electronic Logic”) Explained using Smoking as an Example

*The Surgeon General has said that Smoking is bad for your health.*

*So, why do people still smoke?*

We will use this topic to explain how KEEL works.

[Part 1](#) of this document will show KEEL *thinking* about whether to smoke or not to smoke.

[Part 2](#) explains the algorithm used by KEEL, using the same example.

## PART 1 – KEEL and Smoking

1. Figure 1 shows a simple KEEL application. It consists of one action which indicates a person's desire to smoke (from 0 to 100%).

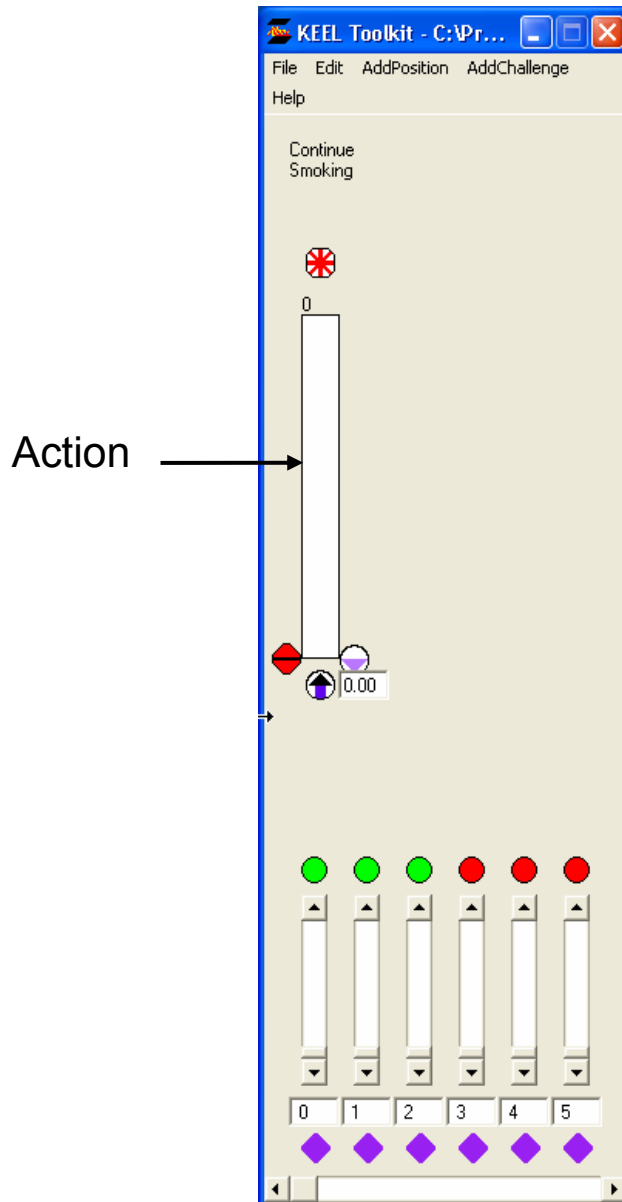


Figure 1

*{Notes: For this KEEL smoking scenario, we've decided to use three (3) supporting reasons a person might use to justify smoking (green), and three (3) objecting reasons (red) that might indicate the person should NOT smoke. These six (6) reasons are the INPUTS to the KEEL smoking application. They have all been set to zero initially. We could use any number of inputs; we just choose to use six for this smoking example.}*

2. KEEL is always “thinking”. We will first say that the smoker has thought of a 30% reason to smoke, and we will use this as our first input.

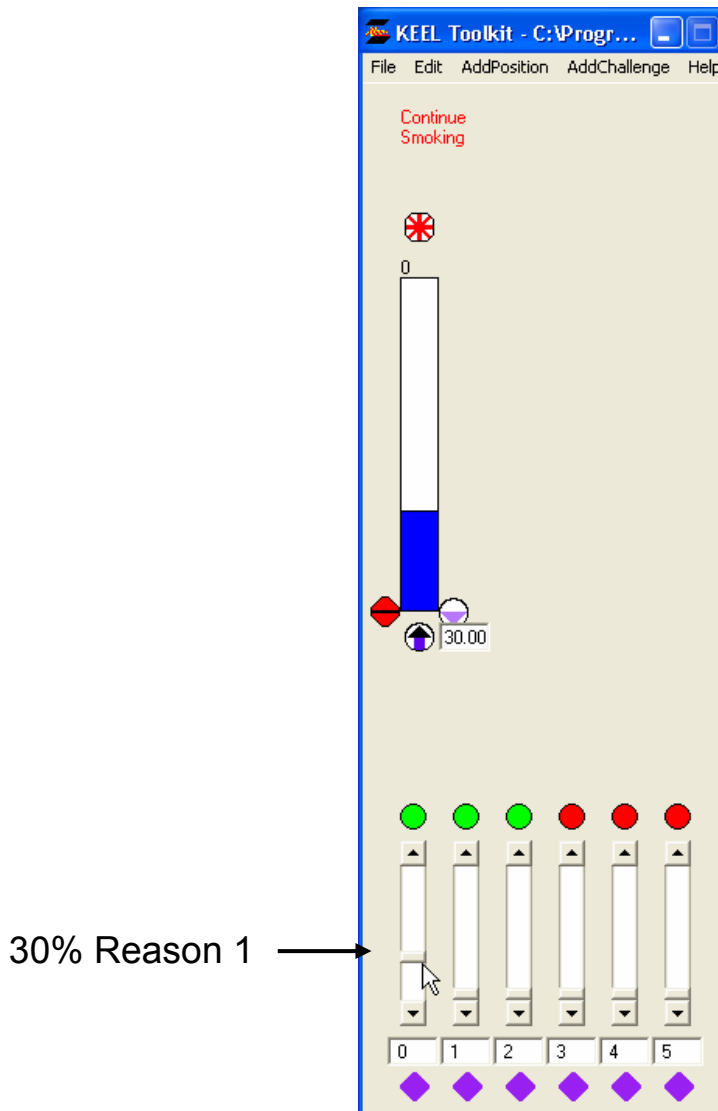


Figure 2

{Note: The middle of the action labeled “Continue Smoking”) shows a value of 30.}

3. Now we will add another reason to smoke at a level of 40% (Figure 3).

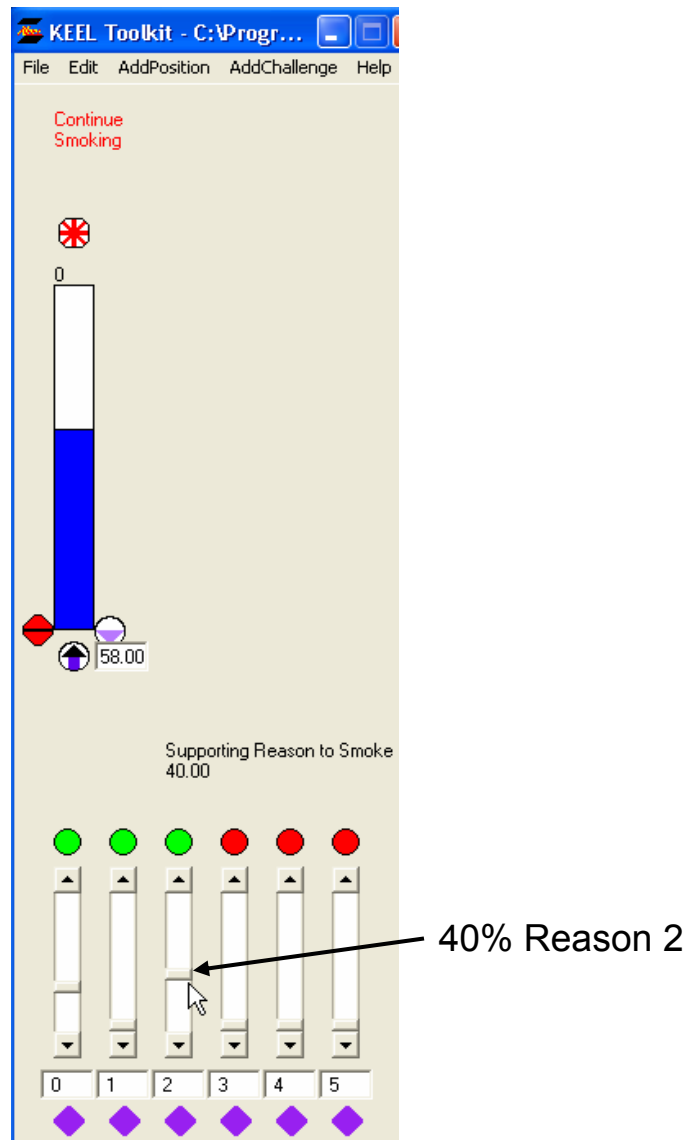


Figure 3

*{Note: The action, "Continue Smoking" now shows a value of 58. KEEL is accumulating reasons to smoke...}*

4. Similarly, we will add a 50% reason NOT to smoke (Figure 4).

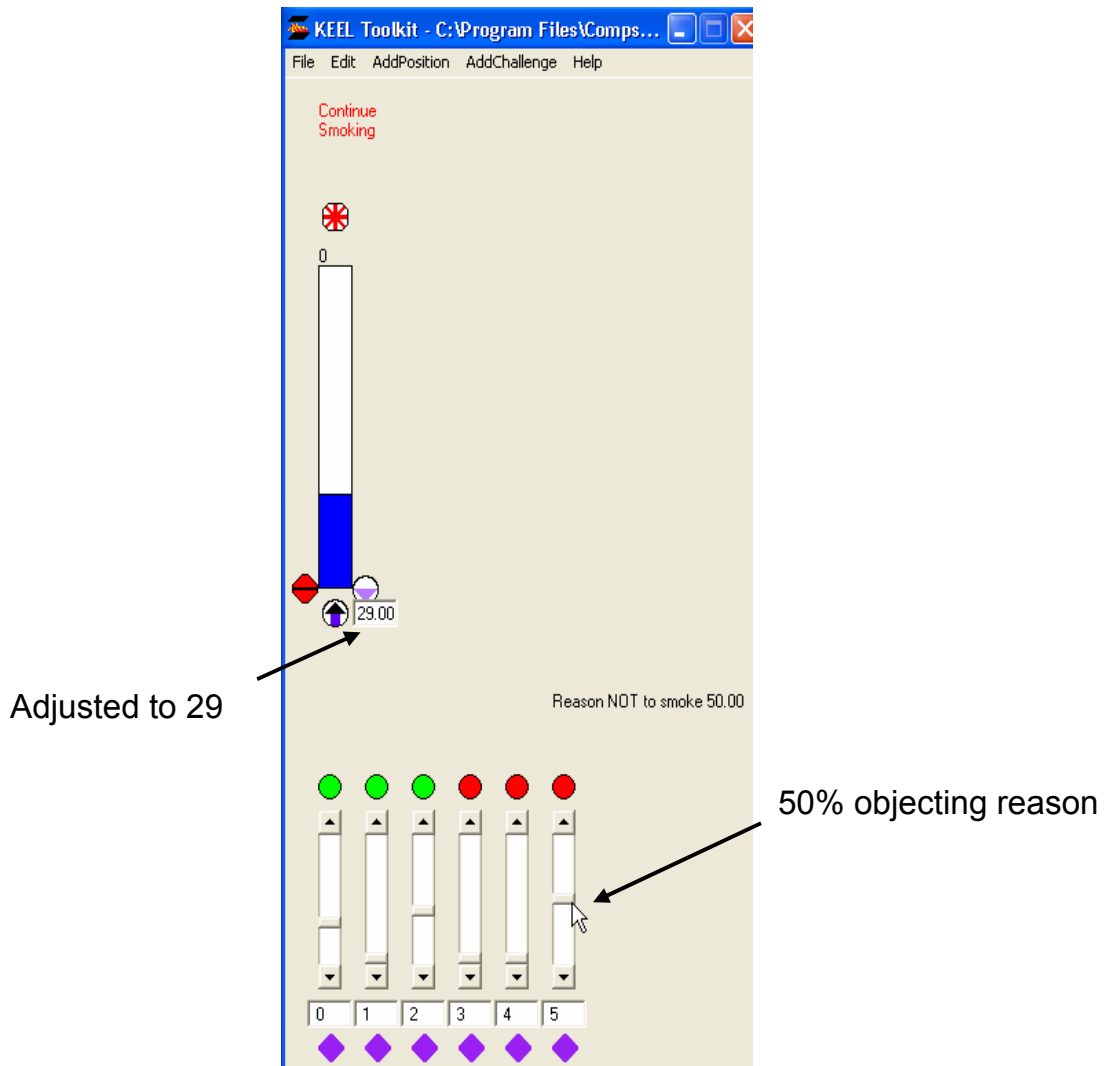


Figure 4

*{Notes: KEEL is accumulating reasons to smoke and reducing from that value reasons NOT to smoke. The sequential order of adding supporting or objecting inputs does not matter. The action, "Continue Smoking" is adjusted to a level of 29 for these three inputs.}*

5. For our next smoking example, suppose that the Surgeon General published a report that stated there was a 95% chance that a person will die if they smoke cigarettes.

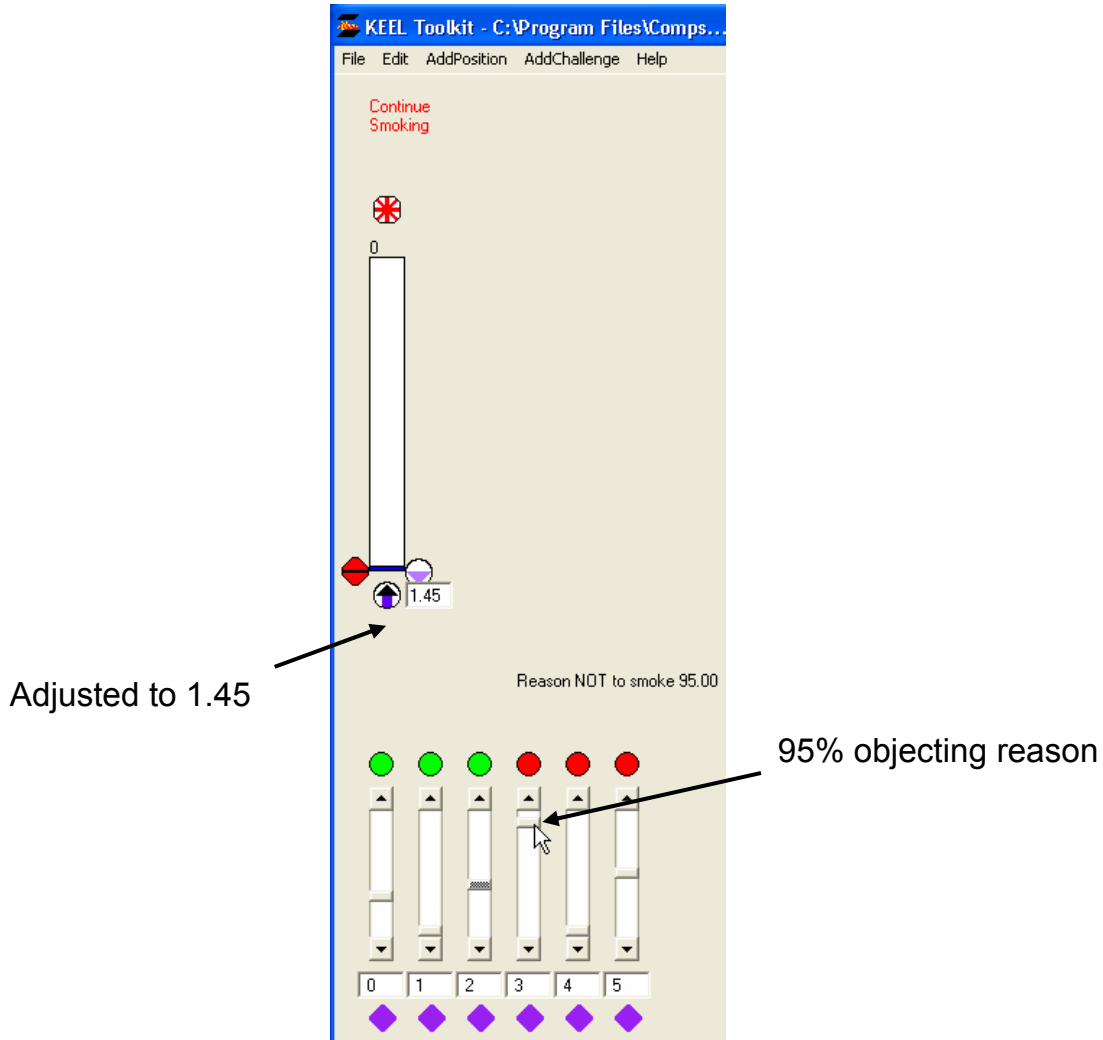


Figure 5

*{Note: The value of the action, "Continue Smoking" is now 1.45. So, although there were a significant number of reasons not to smoke, there still was a little positive reason in the smoker's head that they should smoke.}*

- Now, for our final example, suppose the US government mandated that all cigarettes be removed from all of the stores in the United States. This is what we call an “absolute reason”, or 100%.

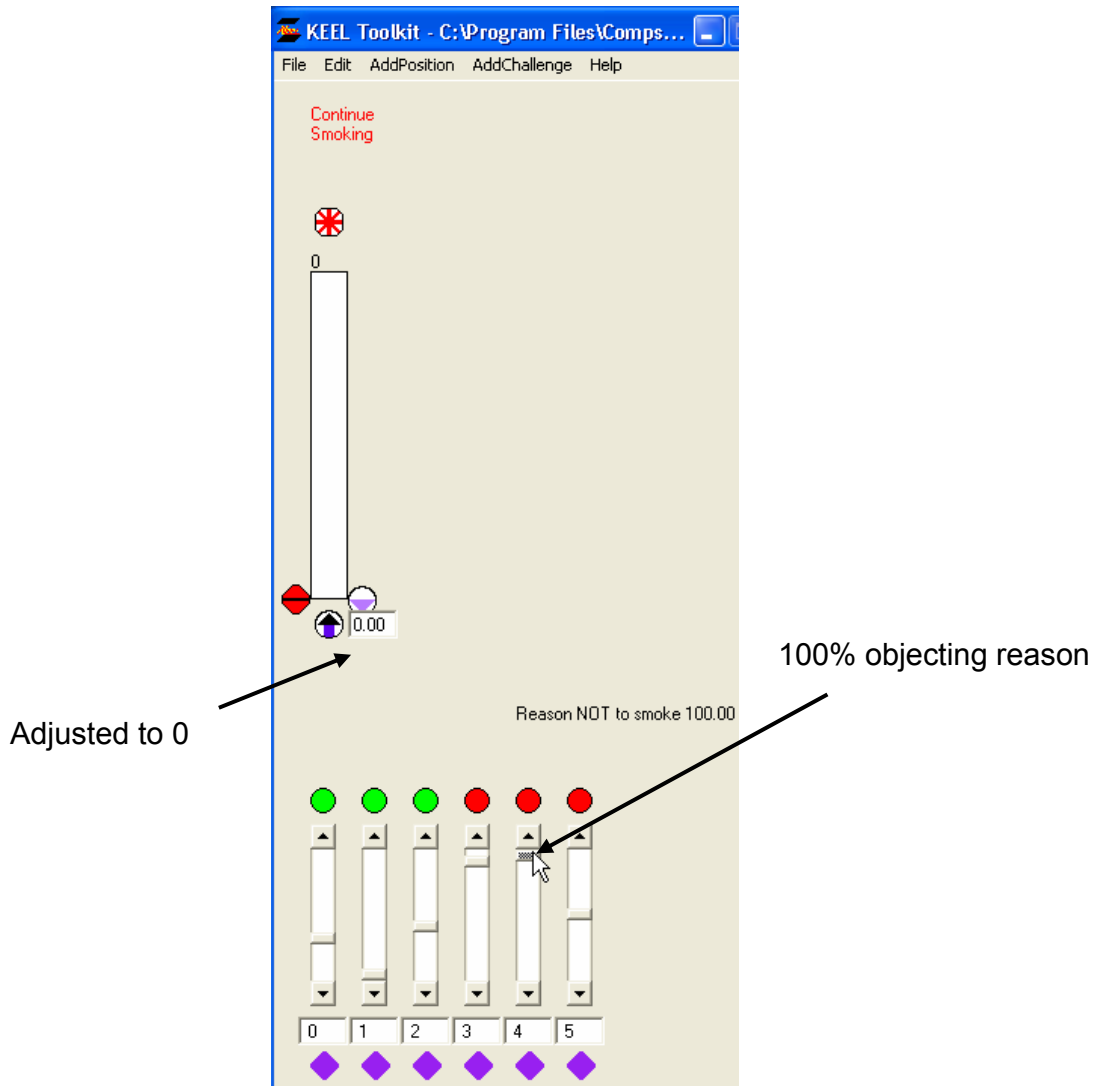


Figure 6

*{Note: Now, due to this absolute reason NOT to smoke, the value of the action, “Continue Smoking” is 0%. Even if there was a 100% supporting reason for an action, a 100% Objecting reason will cause the action to be 0.}*

## PART 2 - The KEEL Algorithm

The KEEL algorithm first accumulates supporting reasons and then accounts for objecting reasons. *{Note: The sequential order of processing the individual supporting reasons, or the individual objecting reasons, is **not** important...}*

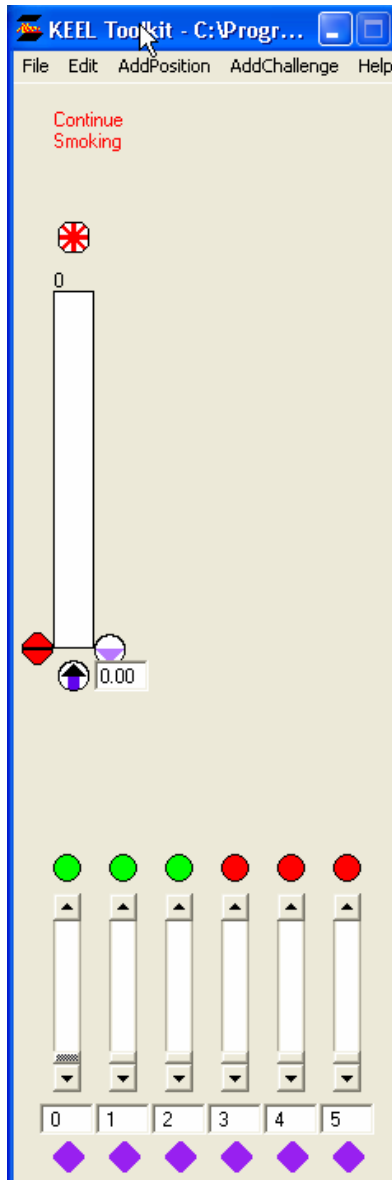


Figure 1 – There are no supporting arguments, and no objecting arguments, so the action, “Continue to Smoke” is 0%.

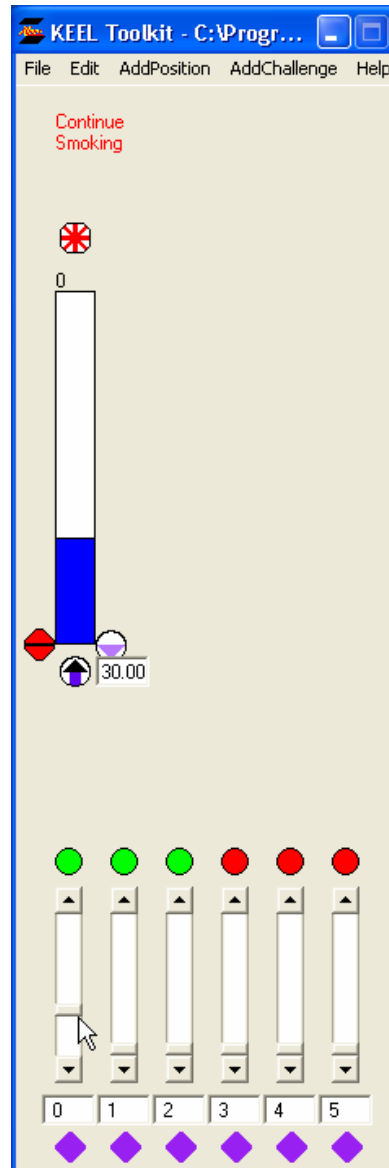


Figure 2 – Accumulate the supporting reasons: There is one 30% reason to smoke, so the action, “Continue to Smoke” is 30%.



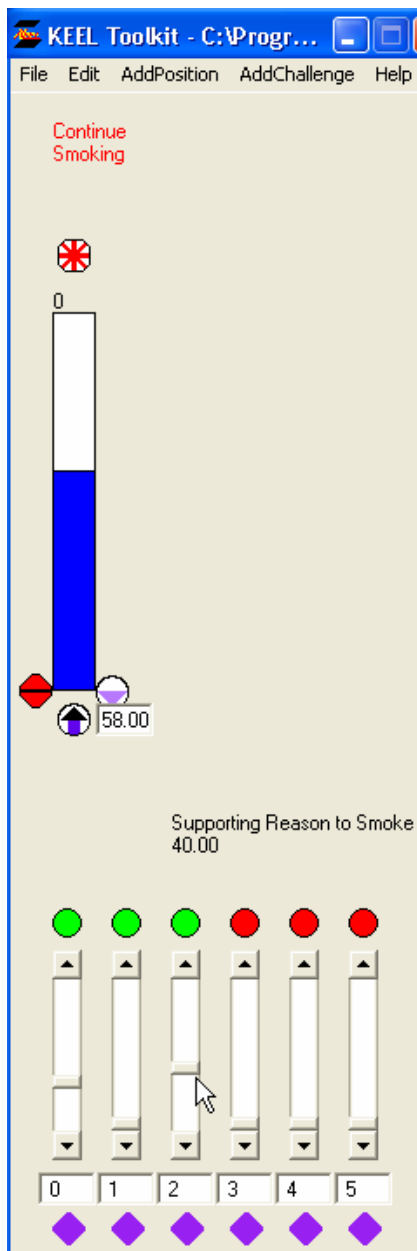


Figure 3 – The action, “Continue to Smoke” is 58%. KEEL arrived at 58% by increasing the first accumulated input (which was 30, see Figure 2) by adding 40% of the remainder.  
 $[30+(40\% \text{ of } 70)]=58$

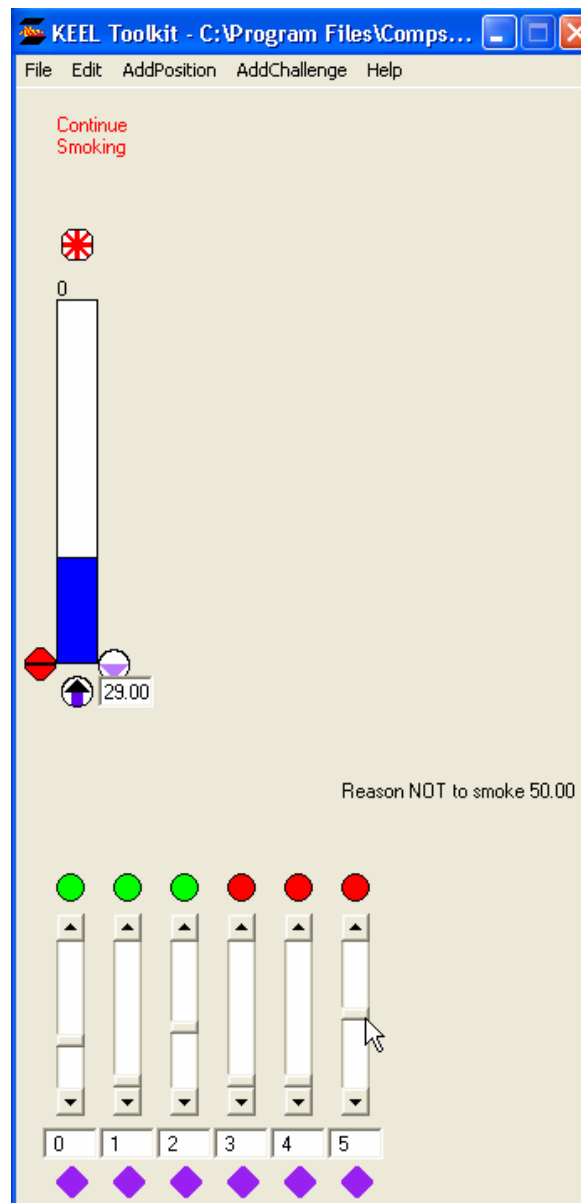


Figure 4 – Account for the objecting reasons: The action, “Continue to Smoke” is 29%. KEEL arrived at this value by decreasing the previous total accumulated action value of 58 (see Figure 3) by subtracting 50% of the objections.  
 $[58-(50\% \text{ of } 58)]=29$

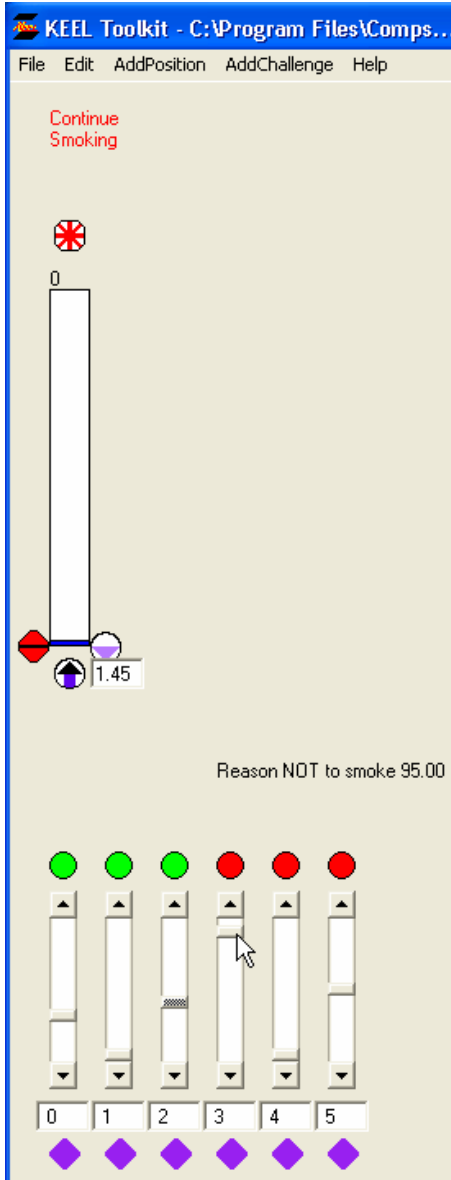


Figure 5 – The action, “Continue to Smoke” is 1.45%. KEEL arrived at 58% by decreasing the last accumulated value (which was 29, see Figure 4) by subtracting 95%.  $[29 - (95\% \text{ of } 29)] = 1.45$

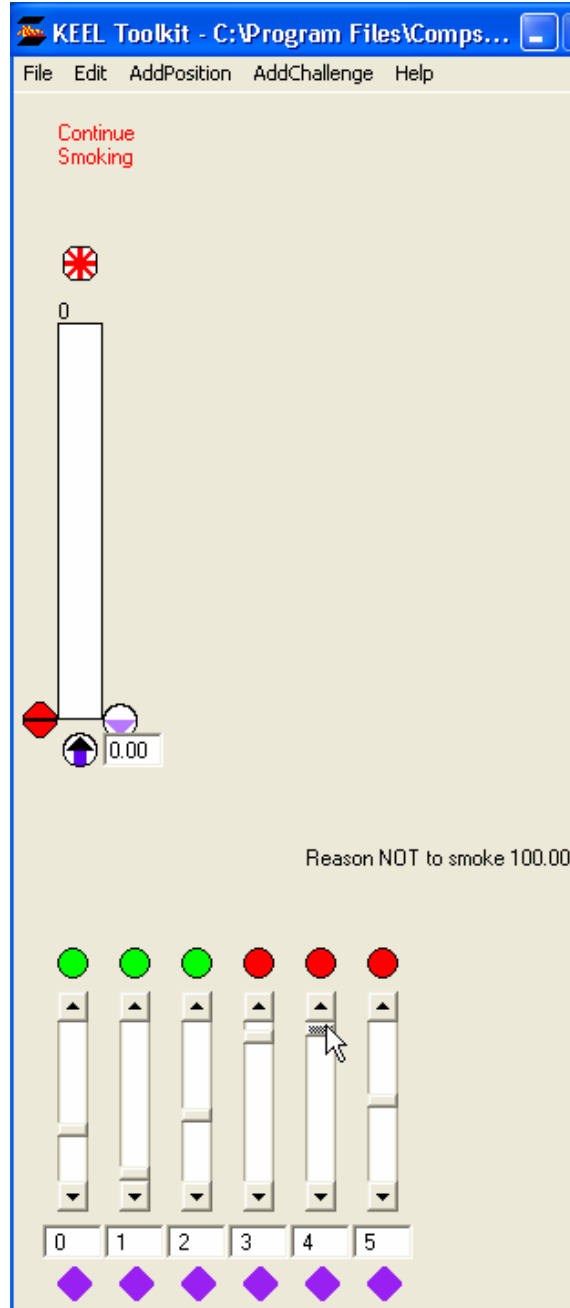


Figure 6 – The action is now 0%, as the objecting reason (the input labeled “4”) was raised to 100%. This absolute value causes any accumulated action values to be subtracted by 100%.  $[1.45 - (100\% \text{ of } 1.45)] = 0$