



<Bono>

This musical robot consists of an old but extremely well made valve trombone, found on the Ghent flea market. It was built by the famous brass instrument builders V.F. Cerveny and Sons in Hradec Kralove (Tchechia). We equipped it with an automated playing head and four automated valves. Normally these valves rotate over a 90 degree angle under finger operation. When we started the automation of this mechanism we had many technical choices with regard to the way the valves could be operated. Our solution consists of using eight pull-type tubular solenoids working on the eccentric pivot point on the valve shafts. Here we get rid of the entire original mechanism and replace it with newly designed traction elbows. In order to get fast response we drive them using our pulse/hold PIC controller boards as developed for our <player piano>, for <Bako> and for <Qt>. The force they are able to develop is only marginal for smooth operation in this robot.

In total, three PIC-microcontroller boards are used in this robot: A first one placed on the midi-input and hub board, controlling the motor driver functions, the expression valve and the visual effects. A second one takes care of the valve combinations used for resonance on the required notes. A third one, -equipped with a dsPIC, type 30F3010, controlling the artificial mouth assembly and the pitch generation. This board also has two digit decimal displays, showing the midi note playing.

For the construction of the artificial mouth we could build further on the experience gained when realizing our automated sousaphone, <So>. However, we also tried out a few other sound generating mechanisms prior to taking up the <So> design again. Thus we tried a servo motor driven rotary valve working on compressed air. This worked soundwise excellently - we could obtain really impressive fortissimos for instance over the entire compass. We finally rejected the application of this technology because we were unable to control the servo fast enough in going from the one speed to the other as required for proper generation of musical pitches. The second problem had to do with the difficulty in finding really silent compressors.

The <Bono> robot was designed to be suspended, thus reducing floor space requirements for the Logos robot orchestra. All mechanical parts were made from stainless steel, welded together using the manual TIG process. All serviceable parts can be taken apart however.

Pitch bend implemented. The range is limited to a semitone, thus a quartertone up or down. Pitch bend can be used for microtonal music as well as for vibrato control.