

## Project Summary:

The guitar that we have presented for our project is named maestro, which means mentor or teacher in Italian. As the name may already suggest, this guitar consists of two main features. The first is an auto-tune feature which requires no external tuner and hence keeps the guitar in tune with maximum convenience by just the strum of the string. The second is an educational platform which serves to enable an amateur guitarist to pick up basic skills like finger positions for a certain note and train his or her tempo when playing any music; this comes packed with a tempo evaluation feature.

Upon keying 1 on the keypad, the guitar enters the auto-tuning mode to tune a higher pitch string to its desired pitch. The player then goes on to pluck the open string. This sound input is fed into the condenser microphone, and after passing through a low pass filter where higher harmonics other than the fundamental one is filtered off, the resulting signal is being amplified and fed into a comparator. Inside the PIC, the eventual square-wave is then measured for its no. of peaks as the frequency of the sound. Any frequency that is higher than the fundamental frequency would be filtered off. Thus, the servo motor turns automatically to tune the string to a lower pitch when it reads a null frequency. The player plucks the string again. As the string tunes closer and closer to the desired pitch, more waves can now pass through the low pass filter. However, this value is rather small. Thus, the servo motor turns to tune the string to a lower pitch when it senses a small frequency of the wave generated by the sound input. For any range of frequencies in between, the string is deemed to be in tune and the auto-tune process is signalled as completed via the lighting up of the green LED and a single buzz.

From the picture below, we can see a stretch of pushbuttons and LEDs being implemented for the educational feature of this guitar. Each button signifies a particular note on the guitar and the LEDs above it lights up when the user keys in a particular note he or she wants to know by pressing 2 on the keypad and choosing the teaching feature. This can be improved to an implementation of notes for all 6 strings as an improved version of the current prototype guitar in this project. Upon selecting the evaluation feature by pressing 3 on the keypad, the buzzer sounds to prepare the user before playing the melody that a player should adhere to in being evaluated. This sequence of notes is displayed on the LCD, following which the user then uses the pushbuttons to play a correct sequence of notes in the correct tempo as that displayed by the blinking of the tempo LED. The user has 2 modes of evaluation, namely beginner and advanced, tailored to help him or her make gradual and self-monitored improvements. The score is shown on the LCD.

