SUMMARY

Sitar, an ancient string instrument with its feminine grace, and descendent of the Veena, is believed to have been devised by Ameer Khusro in 14th Century.

Change is the law of nature; change and development are inevitable in every phenomenon. Sitar has made a long journey, during which it underwent many modifications in size, shape and techniques by many musicians in different time and different places. Today Sitar has the highest place in all string instruments. It is a complete musical instrument and regarded as a respectable pious instrument in Indian culture.

Electronics is a branch of electrical engineering which developed after 1950, and became popular gradually. It is an engineering branch dealing with the smaller amount of current and power governing higher power or micro power application with a great precision and high efficiency. The development in the field of electronics has changed the lives of human being. Every aspect of life has been influenced by the development happened in this field. Musical instruments can not be the exception.

Because of the development in the field of electronics, Synthesiser, Octopod, Electronic Guitar, Electric Sitar, Taalmala, Electronic Tanpura, and Zitar came into the picture.

It is seen that Synthesisers are being used in place of Harmonium, Electric Guitars are replacing traditional Guitars, Electronic Tanpura is replacing manual Tanpura, and Taalmala has started assisting instrumentalist by replacing tabla player at least in the practice sessions, and so on.

Presence of all these instruments is seen in the contemporary music. Electronic musical instruments have some advantages over traditional musical instruments as follows.

- They don’t require tuning, and can be tuned easily if required.
- They can change their pitch easily.
- They are made as per the standardisation. So easily available across the world with a Uniform Quality, Performance, and Price.
- Their sound can be easily connected or picked up by the microphone. It is comparatively easy to process, and amplify the sound signal produced by them.
- These instruments are carrying the facility of the sound recording and sound reproducing.
- They are having the compatibility with the computer, so sound signal produced by them can be easily edited or processed, or can be mixed with other sound, which is the basic necessity in the age of digital world.
- Most of them are machine made having good quality control in manufacturing process hence dependency on instrument maker is almost nil.
- These instruments are made of the fibre or plastic with a good long life.
- Aesthetically these instruments are very attractive and colourful. They are light in weight, less bulky, not very fragile, portable and fascinating the musicians.
- Being designed by big companies they are upgraded and amended time to time with new technical development.
- They are available with their manual and technical details. So one can understand its scientific facts easily and learn its playing with basic learning books available for them.

Presence of electronic musical instruments has affected and influenced the performance of traditional musical instrument Sitar. As a result when we make use of Sitar in live concerts of contemporary music we find the difficulties as follows.

- In orchestra or live concerts Sitar has to be tuned sometimes in the pitch other than standard C, C#, or D.
- Even this tuning has to be altered frequently during a single show.
- A quite noise free environment is not available to tune the Sitar.
- Sitar timbre is of a typical type, its voice is not picked up by a normal microphone. A special arrangement is required for picking its sound.
- Its tone gets supressed in the presence of the other instruments.
- If a special care is not taken its tonal quality gets changed and hence affecting the performance and hence the response of the audience.
- The success of Sitar performance mainly becomes dependent on the sound operator.

In short: Sitar Timbre gets irrelevant, during live concerts, while playing along with other musical instruments; it becomes difficult to tune during its operation in live concerts, and have to keep dependency on sound operator for expected tonal quality.

So here it is clear that “In recent years a lot of development has taken place in the field of electronics related to all musical instruments in direction of sound production, propagation and reception but it has not happened up to the mark for Sitar”.

So some features are desired to be implemented in the Sitar to make it more competent in accordance with the contemporary Indian as well as Western musical Instruments.

The main purpose of this research is to find out the short comings of Sitar, difficulties playing it, and to make amendments in it, for its utility in live concerts of contemporary music.

After a long research, study and getting the opinion of the learned Sitarist and musicologist, researcher has noted down the shortcoming and difficulties of Sitar while playing in contemporary music, and also listed the features which can be added to the traditional Sitar to make it competent in accordance with contemporary Indian as well as Western musical instruments.

The researcher was fortunate to have knowledge of Music and Electronic Engineering by having graduation in both of them, which is a state of an art in itself. Having good experience in both the fields, researcher started learning the problems faced by Sitarists during their playing. To know more about these problems researcher had a number of sessions of discussion with his guide Prof. (Dr.) A.S.Pathan who himself is a well-known Classical as well as an Orchestral music artist. On discussion many points pop up in front of us.

Having the list of problems researcher started finding the solutions, naming it as '**Feature**' for each of them so that these problems can be resolved.

Depending upon the working principle, researcher has classified the features into three categories i.e. Electronic Features, Physical Features, and Aesthetical Features.

Below is the list of features which can be attained by doing the changes internally or added externally to the main instrument.

List of Desired Features

- Electronic features
- Physical features and
- Aesthetical features

Electronic Features

- Amplification
- Changeable Tonal Quality
- Changeability of Sustention of the Sound
- Tuning
- Recording of Sound
- Retrieval of Sound
- Monitoring of Output Sound
- Volume Control
- Mute

Physical Features

- Portability
- Durability/ Unbreakable
- Light Weight & Compact
- Foldable
- Standardisation
- Pitch / Scale Changeability
- Fine Tuning of Pegs Using Digital Press Buttons

Researcher had focused in fulfillment of electronic features in an analytical way, and in a practical way to some extent.

- For that, he referred the latest available data of invention in this subject on the internet.
- He also learned the thesis already published in related subject.
- He also met various electronic musical instrument suppliers and makers and knew the different apparatus available in the market to fulfill the subject requirement. He bought and tried some of them and experienced their usage.
- The library is the biggest source of literacy, musical and scientific reference books. The researcher visited libraries and studied many manuals of different gadgets. He captured some pictures from various museum to learn the history and evolution process of Sitar. All these pictures are included in this thesis.
- He went to the industry and verified the facts and correctness of his suggested solutions.

He put up an analytical study of fulfillment of desired features of Sitar in utility of live concerts of contemporary music.

By using some techniques and devices available in the market, researcher could make a remedy for the electronic features. A unit is suggested using a right combination of Transducer, Signal Processor, Tuner, Power Supply, Housing and some other parts.

With the help of the suggested unit, Sitar sound can be processed in a right manner, producing amplified sound in the **Original Tonal Quality**. Very minute particles can not be seen by our naked eyes but the same can be seen using the microscope.

Similarly minute lower frequency sound can not be heard by the naked ears but can be definitely heard if a proper amplification is done.

Suggested unit gives uniform amplification across entire range of audible frequency, taking care of minute sound.

The feature of Volume Control and Tonal Quality Adjustment removes the dependency of Sitarist on the sound operator in the live concerts.

Changeability of Sustention of the Sound becomes possible by adjusting filter control knobs.

Tuner display provided in the main unit gives Sitarist an ease of tuning, not only for the seven main strings, but also for all the sympathetic strings with a great precision, even in a noisy environment.

Feedback device, feedback control switch keeps the Sitarist aware about the sound reaching to the audience and can guide him to do necessary changes in control panel, if needed.

Additional feature of recording and retrieval of sound makes it technically rich.

Activating Mute function of the processor, unwanted output sound can be stopped during tuning process or unexpected circumstances.

Handy mixing console offers Sitarist a dominating position in the orchestra.

Though the instrument is enriched by value added features, Timbre will not be affected in any manner / can be varied as per requirement of an artist.

As a result the instrument is enriched in such a manner that it gets synch and equivalency in accordance with other Indian or Western musical instruments in live indoor concerts. Thus, traditional Sitar matches its step with the technology making it more competent for its utility in live concerts along with other Indian and western instruments.

Some physical features are added in addition to the electronic features as discussed in the previous part i.e. Compactness in Size, Portability, Lightness In Weight with Enhancement in Aesthetical values, will give Sitar a Royal, Rich, Trendy And Touchy look, offering it a New International Recognition.