VOICE CONTROLLED CHAIR USING THEO – JANSEN MECHANISM

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*Abstract:*The Jansen's linkage is basically a crank based mechanism wherein the rotary motion of one link of the mechanism is converted into the walking motion of the entire mechanism. The foot of the linkage is the contact with the ground which has the four phases of lifting, returning, supporting and lowering which in combination propels the system forward.The Jansen Linkage in its raw form cannot be utilized for the purpose of making a walking chair as it was designed for a single leg on huge Strandbeast. Hence there should be a proportionate reduction in the linkage lengths without losing the desirable traits mentioned in the previous section.

I. INTRODUCTION

Voice controlled chair using Theo- Jansen mechanism for paraplegic patients is an innovative idea in the field of rehabilitation. For precise control and accurate movements, the voice control mechanisms are used by the patients. Voice controlled movement will be extremely helpful to someone who might lack the physical ability to move both their leg.Paralyzed patient face difficulties in operating a wheelchair with the current modes as it requires assistance. To make them feel more independent and operate the chair by themselves, the idea of operating the chair using voice commands is being proposed. In addition to that, modification of the existing mode of locomotion has led to introduction of Theo Jansen mechanism. It is an extension of a four-bar mechanism and it has several advantages over the conventional wheel. The drawbacks of wheels which are overcome by Theo Jansen mechanism are as follows:

- Wheels undergo a lot of wear and tear.
- The distance covered per rotation is less.
- Consumes more power.
- It has limited maneuverability.
- More friction is generated.

According to a recently conducted census about 2.13%of total population of India comprises of physically disabled people. 75% of the disabled live in rural areas, only 49% are literate and only 34% are employed. While earlier the focus was on medical rehabilitation of these people now the focus has shifted to the social rehabilitation of the same and hence independency remains an untold parameter in this.

Another important factor that restricts the modern technology invading and improvising the lives of these people is the cost involved. The poorer section of the disabled is found on the streets of India making their living through various sources. Due to the terrain and the road conditions these people face difficulty in adapting themselves in any public facility and hence are very often assisted by another member. This puts underdevelopment stress not only on the differently able but also on the person assisting him. Hence the idea of making them independent and adaptable to Indian terrain was thought of in the form of walking chair. The concept was then thought of to make it cheap and available to all sections of the society.

The Theo Jansen mechanism is gaining widespread popularity among the legged robotics community due to its scalable design, energy efficiency, low payload-to-machine-load ratio, bio inspired locomotion, and deterministic foot trajectory. In this paper, we fabricate the eight-legged robot driven by a dc motor and spur gears composed of Theo Jansen mechanisms.

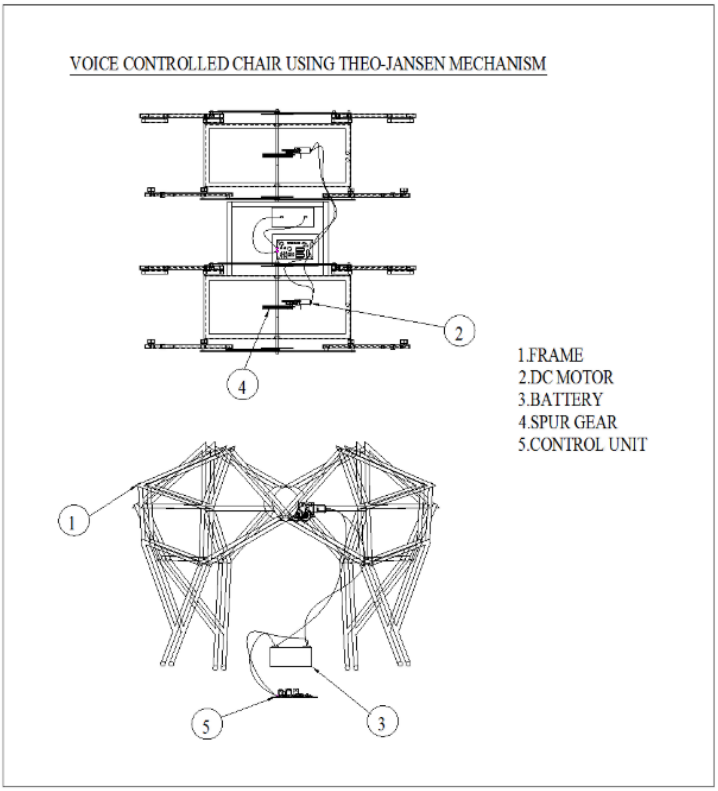
II WALKING MECHANISM

It is well known that animals can travel over rough terrain at speeds much greater than those possible with wheeled or tracked vehicles. Even a human being, by "getting down on all fours" if necessary, can travel or climb over terrain which is impossible for a wheeled or tracked vehicle. Nature, apparently, has no use for the wheel. It is therefore of considerable interest to learn what machines for land locomotion can do if they are designed to imitate nature. With this idea in mind I started studying linkages and the comparative function of a set of linkages with certain degrees of freedom arrested. It turned out numerous implementations could be done so as to bring forth set of linkages so designed as to perform locomotion.

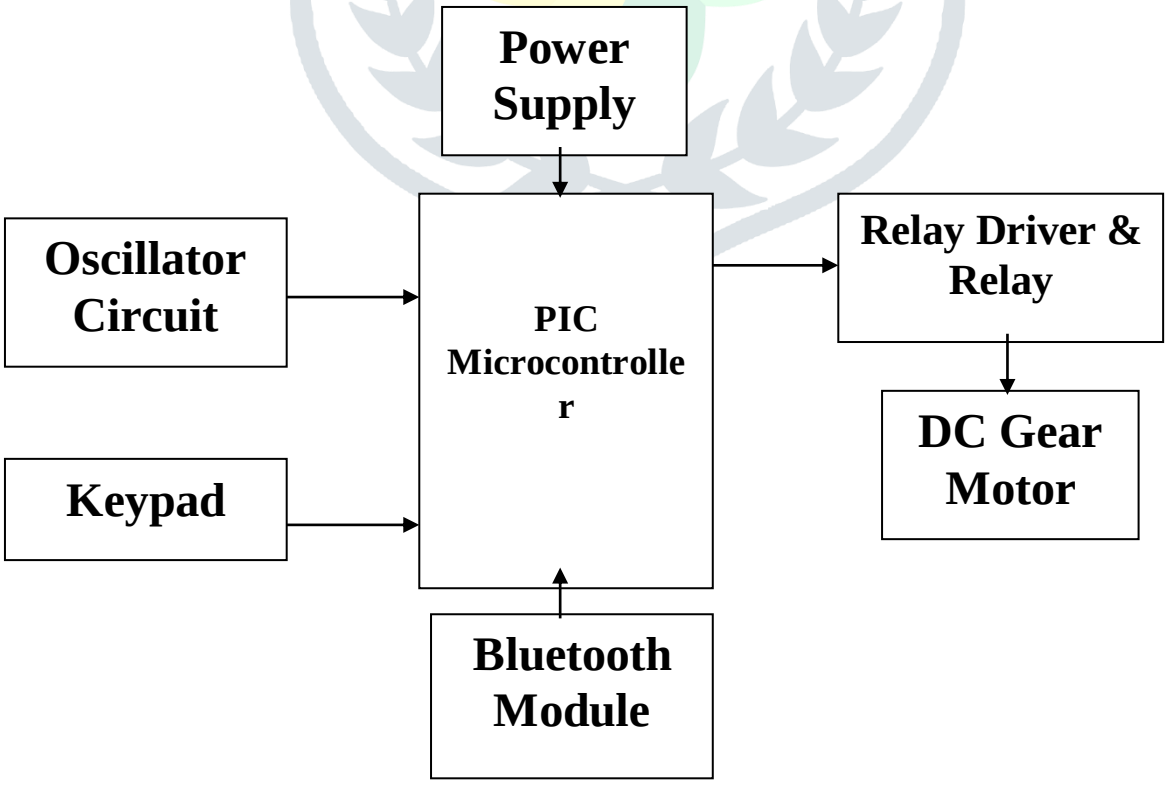
As mentioned above nature has always chosen legs as the best mode of locomotion so using linkages, we tried to mimic nature and come up with certain walking mechanism which will suite all terrain. After reviewing certain mechanisms, we came across two of them which proved to be more efficient.

III THEO JANSEN MECHANISM

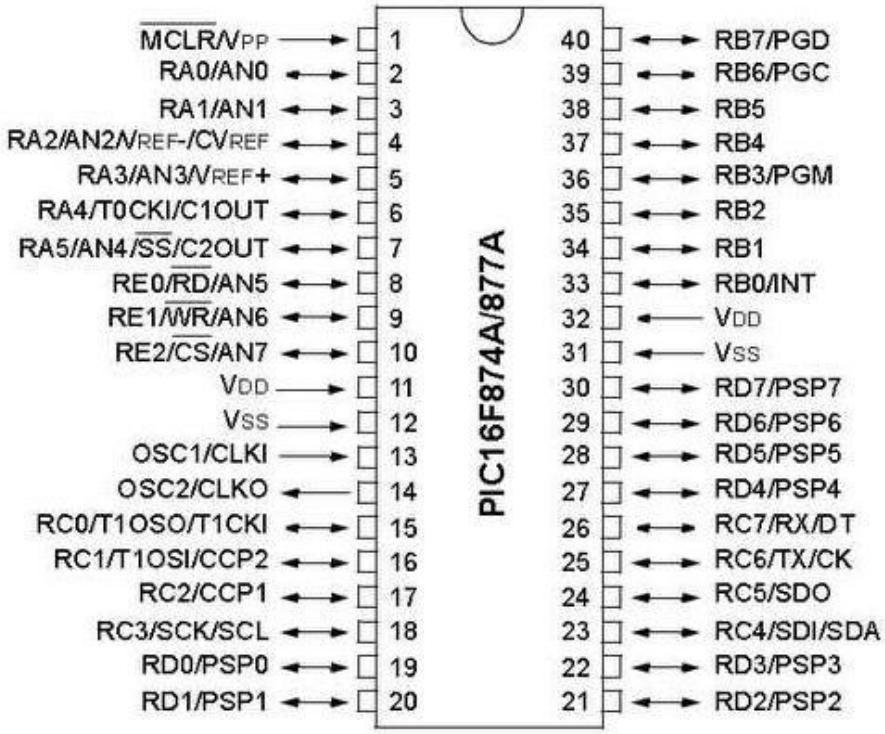
Using eleven small rods, Dutch kinetic sculptor Theo Jansen has created a planar mechanism that, when used in tandem with many others identical to it, can walk in a smooth forward motion. The resulting device has a very organic look, much like a creeping animal. His “beasts” have been made to be wind powered, using a combination of wind sails and empty plastic bottles that can be pumped up to high pressures. Using inspiration from Jansen’s “Strandbeast” kinetic sculptures, this project aims to create an alternate for wheels which can be used for rough terrains.



IV VOICE CONTROL MECHANISM



Pic Microcontroller Introduction



Microcontrollers give you a fantastic way of creating projects. A PIC microcontroller is a processor with built in memory and RAM and you can use it to control your projects (or build projects around it). So, it saves you building a circuit that has separate external RAM, ROM and peripheral chips.
What this really means is that you have a very powerful device that has many useful built in modules e.g.

- EEPROM.
- Timers.
- Analogue comparators.
- UART

Even with just these four modules (note these are just example modules - there are more) you can make up many projects e.g.:

- Frequency counter - using the internal timers and reporting through UART (RS232) or output to LCD.

- Capacitance meter - analogue comparator oscillator.

- Event timer - using internal timers.

- Event data logger -capturing analogue data using an internal ADC and using the internal EEPROM for storing data (using an external I2C for high data storage capacity.

- Servo controller (Control through UART) - using the internal PWM module or using a software created PWM.

The PIC Micro is one of the most popular microcontrollers. The difference between a microprocessor and a microcontroller is that a microcontroller has an internal bus within built memory and peripherals.

In fact, the 8 pin (DIL) version of the 12F675 has an amazing number of internal peripherals. These are:

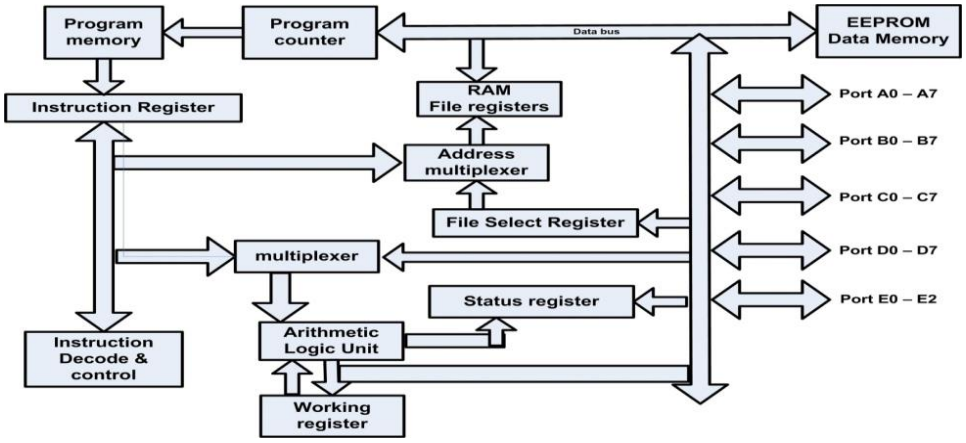
- Two timers.
- One 10bit ADC with 4 selectable inputs.
- An internal oscillator (or you can use an external crystal).
- An analogue comparator.
- 1024 words of program memory.
- 64 Bytes of RAM.
- 128 Bytes of EEPROM memory.
- External interrupt (as well as interrupts from internal peripherals).
- External crystal can go up to 4MHz.

PROGRAMMING

One of the most useful features of a PIC microcontroller is that we can re-program them as they use flash memory (if you choose a part with an F in the part number e.g. 12F675 not 12C509). We can also use the ICSP serial interface built into each PIC Microcontroller for programming and even do programming while it's still plugged into the circuit.

We can either program a PIC microcontroller using assembler or a high-level language using a high-level language such as C as it is much easier to use (after an initial learning curve). Once you have learned the high-levellanguage are not forced to use the same processor e.g.,we could go to an AVR or Dallas microcontroller and still use the same high-level language.

A PIC Microcontroller can control outputs and react to inputs e.g. you could drive a relay or read input buttons. With the larger devices it's possible to drive LCDs or seven segment displays with very few control lines as all the work is done inside the PIC Micro.
Comparing a frequency counter to discrete web designs you'll find two or three chips for the microcontroller design and ten or more for a discrete design. So, using them saves prototype design effort as you can use built in peripherals to take care of lots of the circuit operation.
Many now have a built in ADC so you can read analogue signal levels so you don't need to add an external device e.g. you can read an LM35 temperature sensor directly with no interface logic.



V RESULTS AND DISCUSSIONS

A strong multidiscipline team with a good engineering base is necessary for the Development and refinement of advanced computer programming, editing techniques, diagnostic Software, algorithms for the dynamic exchange of informational different levels of hierarchy. This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We have completed the work with the limited time successfully. The "Voice Controlled Chair Using Theo-Jansen Mechanism" is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality.

We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work. Thus, we have developed a "Voice Controlled Chair Using Theo-Jansen Mechanism". By using more techniques, they can be modified and developed according to the applications.The benefits of walking over rolling on rough terrain are that it has Higher energy efficiency, better fuel economy, Increased speed, Greater mobility, improved isolation from terrain inconsistencies, It's very useful for all Handicapped.

VI REFFERENCE

- Manufacturing technology (Machine Processes & Types)-G.K.Vijayaraghavan.
- Engineering economics & cost analysis (Cost of Material)-S.Senthil, L.Madan, N.Rabindro Singh.
- Design data book -PSG College of technology
- Strength of materials -R.SKurmi