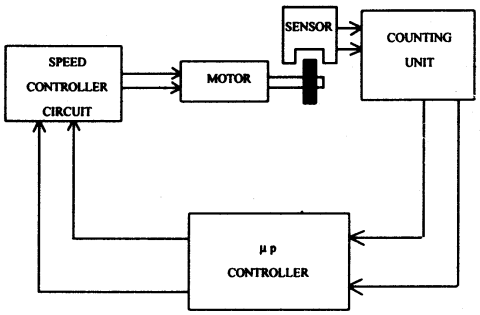
DC motor speed control using Microprocessor technique

Intoduction :



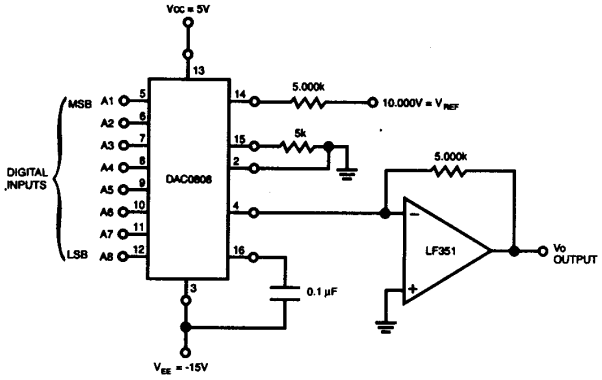
BLOCK DIAGRAM

This is the block diagram used in the project!
Here the DC motor is controlled by the microprocessor (8085). The kit used was dynalog 8085 kit.
The DC motor is very difficult to control unlike the stepper motor, which can be controlled by giving the appropriate CONTROL WORD.
By knowing the DC motor theory we know the different methods used to control the motor, the most primitive and the once upon a time the most popularly method was WARD-LEONARD motor speed control, but this had many disadvantage, so the world of Electronics brought in the thyristor control, which were very flexible and can be employed to use AC instead of DC cause they had a inbuilt convertor. The thyristor-based system is good but when used with Microprocessor based speed controller they are really good. We have shown the block diagram, circuit diagram used by us to control a small tape recorder sized motor

SPEED CONTROL:-

. The microprocessor takes a feedback from the 'CONTACTLESS INFRARED LED SPEED MEASUREMENT' designed and developed by us. It is similar to a rotary encoder we used only one wooden rigid disc with a hole (even at center for mounting purpose). Then using a sensor (Infrared) like those readily available in the market (we have shown it in diagram) or a common infra LED pair mounted and aligned properly to sense each other. When the DISC rotate the counter starts counting but it increment only when the LED come in sight of each other which is possible when the hole portion of the disc comes in turn we can find the speed of the rotation by proper calibration .The main task of counting, calibrating, calculating, comparing is incorporated in the software used the 8085 system (EPROM).So by comparing the speed reading with the w anted/predetermined speed we can adjust the threshold controlling the DC motor power supply and hence in turn control the DC motor.

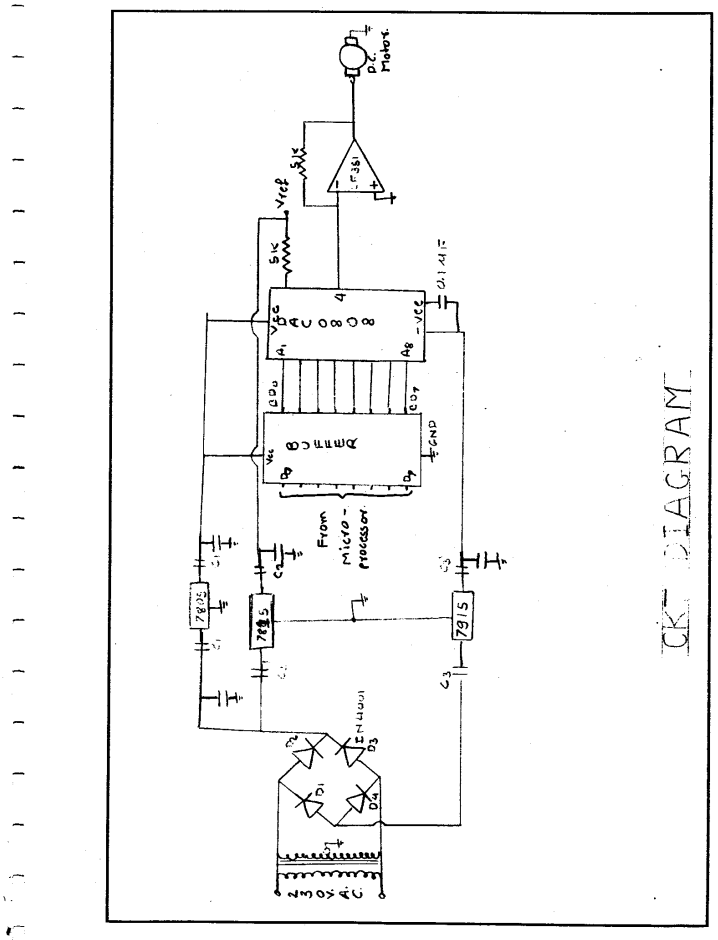
CIRCUIT DIAGRAM AND DESCRIPTION



CIRCUIT DIAGRAM

Safety:-

It's important to isolate the power supply region, the controlling section and the digital microprocessor hardware section. To isolate the digital system we can use IC's like MCT2E, or to control directly MC series has another IC, which incorporates a TRIAC directly! So easy to control higher power rating/Voltage motor. It's always better to use separate PCB for each .The EPROM should be isolated as possible from the power electronics appliances!



This diagram shows a novel ideal implemented to control a small 12V DC motor.

APPLICATIONS: -

JERKLESS LIFT

The main design approach was basically for a '*jerk less'* lift. E.g., In day to day life lift is used in every apartment, towers etc but we many times experience some jerk at start and stop of the lift i.e. from going from one floor we press the station/floor no then the lift starts and at that time there is a sudden jerk and one fill easy now the motor goes at a relative constant speed so we don't feel a jerk, but when the station approaches the lift stops with a jerk and we get annoying jerk again which is quiet a bad experience.

The solution to this is to control the speed of the motor in a predetermined curve, which starts the motor smoothly, and as it approaches the station it would slowly slow the lift, so there is no jerk! . The curves are predetermined by testing for comfort by the testers and optimum values are found and handed over to the engineer who fill chalk out a speed plan for each station and write a software using microprocessor/microcontroller based system and feed the necessary software and speed curve in the EPROM.

AUTOMATION

For automation the DC motor i.e. for going to a special predetermined speed a microprocessor based controller can be useful due to the 8085 system which can be programmed for literally anything The application can be a simple machine, Hoist Or any robotic assembly as used in the assembly of car, the microprocessor can be used simultaneously to do some other work than speed control or use the data obtained from the various sensors and perform change in the speed of the motor. We can also use to record various speed changes in the motor speed for data storage/statistical purposes.

Changes to use for use in Industrial applications

The project that we had designed is basically for a small DC motor of 12v. To use for high rating/voltage we can use the output of operational amplifier as a control voltage by suitable designing to a SCR controller, TRIAC controller or using suitable voltage/power raising techniques .I also suggest another technique which I did mentioned at one of the previous sections of using 'MC' series IC with inbuilt infrared transistor to infrared TRIAC for direct controlling, this IC has advantage of sufficient isolating the digital system and the analog controlling part.

For any queries please fill free to contact me at hgokhale@lycos.com, please do not send same mail twice.