

Computer Controlled Variable Power Supply

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1. Introduction

A computer controlled variable power supply is a DC power supply in which the output voltage can be adjusted using a computer interface. The objective of this project is to build a fully digital control power supply with a user interface with features like voltage sweep.

An AC - DC power supply steps down the AC voltage and converts it to a fixed DC voltage which will be then varied.

MOSFET stands for metal-oxide semiconductor field-effect transistor. It is a special type of field-effect transistor (FET). A MOSFET is used for varying the output voltage. MOSFET is a voltage controlled device. MOSFETs have "gate", "Drain" and "Source" terminals. MOSFET may be thought of as a variable resistor, where the Gate-Source voltage difference can control the Drain-Source Resistance. When there is no applying voltage between the Gate-Source, the Drain-Source resistance is very high, which is almost like an open circuit, so no current may flow through the Drain-Source. When Gate-Source potential difference is applied, the Drain-Source resistance is reduced, and there will be current flowing through Drain-Source, which is now a closed circuit.

ATmega328p is used as the microcontroller for this project. It is an 8 bit controller, 28 Pins in a PDIP package. This controller has 6 PWM channels and 6 10bit ADC channels. These will be used in this project for controlling and to process feedbacks from the output voltage.

A computer interface will be developed using tcl/tk language with features to manually set a desired voltage, to perform a voltage sweep within a specified range and with specific intervals and specific step sizes. Output voltage will also be displayed in the interface.

2. Targets

The main targets to be achieved to complete the project are:

- Building an AC - DC power supply with an output of about 40VDC
- Build a DC-DC buck converter with digital control
- Designing a microcontroller based control system
- Designing a computer GUI for user control

3. Methodology

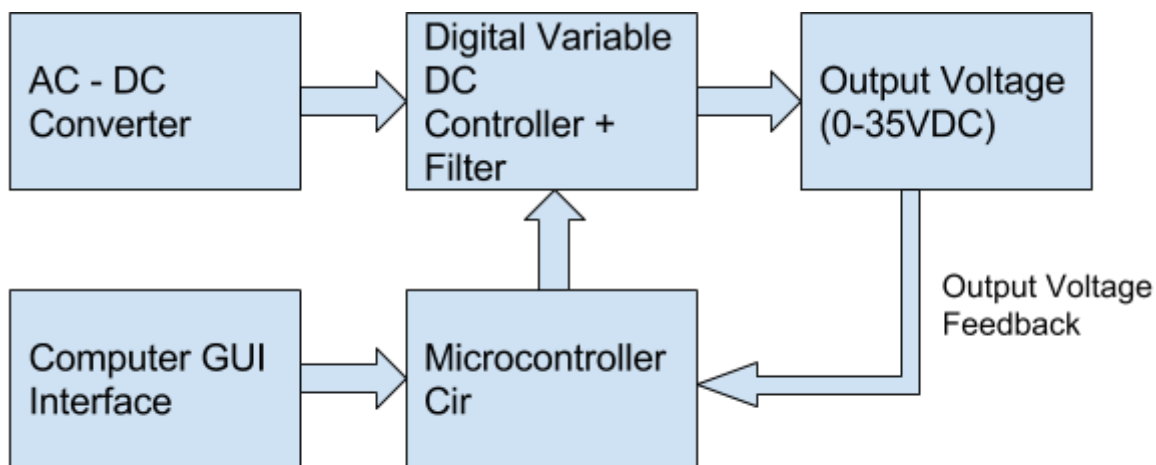


Figure - 1: Overall block diagram of the system

Figure - 1 shows the overall block diagram. An AC - DC converter will be built to supply a fixed DC output. The output from the rectifier will be applied to the regulating circuit. A MOSFET is used for regulating the voltage. A MOSFET is used for this purpose as it can be controlled digital and more accurately using PWM signals. Output filters will be used to produce a clean DC signal as output from the MOSFET will not be a DC signal. ATmega328p is used as the microcontroller. This acts as the interface between the computer and the power supply. The ATmega328p also takes feedback from the output to verify the correct voltage is being produced and also to display the output voltage to the user. A GUI interface will be designed in the computer for the user to interact, the GUI will include features to do a voltage sweep in desired step sizes and desired intervals. A seven segment display will be included in the circuit to display the output voltage for ease of use.