F2044 ABSTRACT

This project is a real-time interactive martial arts training system. Incorporating high-quality digitized audio and speech feedback, it simulates a bout with an opponent while providing audio motivational cues and other helpful feedback. It offers three different skill level settings, with bouts ranging from three to six rounds, and is designed to be very user-friendly and economical. The sensor(s) and speaker are separate from the electronics themselves and connected via regular 2 conductor wire via jacks.

The digitized audio is via Winbond's ISD2500 series of CHIPCORDER ICs. The 2560 has been chosen, giving us the highest quality sample rate and a full minute’s worth of audio messages. It is used in MESSAGE CUEING with CONSECUTIVE ADDRESSING OPERATIONAL MODE; this allows our design to skip through the stored messages without caring about the actual addresses of each message – somewhat like an analog tape recorder, only much faster! We only need one extra line to implement it (as opposed to up to 10 by directly addressing).

Any type of sensor that's out there (piezoelectric, accelerometer, etc.) can be easily used to sense the impacts.

The microcontroller of choice comes from Motorola's M68HC08-based Nitron family; specifically, it is the 8 pin MC68HC908QT4. It includes a 4-channel, 8-bit analog-to-digital converter (ADC) and 4096 bytes of FLASH memory while offering 5 bidirectional I/Os and 1 input–only line.

Three parts make up this design. The microcontroller’s job is to ‘listen’ for any impacts on the sensor through its built-in ADC and, while monitoring the time remaining, register the impact force and track the user's performance during the workout. At the appropriate time, it will ‘wake up’ the ISD chip and tell it which corresponding audio message to play through the speaker. The third part of the trio is the power conditioning circuitry mostly made up of a 78L05 voltage regulator and a few capacitors for filtering and decoupling.

On powerup, the ISD2560 is placed in standby (low-power mode) – this is where it will be when not playing audio. It then plays an introduction and the user is prompted to choose a level by striking the target at the right moment; this ‘menu’ will keep repeating until a choice is made or the unit is turned off.

A periodic interrupt timer is utilized to accurately measure the time passed.

When a choice is made, the audio simulation of a boxing (etc.) match with the round number and fight bell sounding proceeds to start.

During the three minute rounds, the on-board ADC registers the target strikes via the sensor and judges their force. Decisions based on this info and the timer are then made and the respective audio cues played back.

At the end of the round, if it’s not the last one, the periodic interrupt timer counts down a 60 second rest period while playing crowd cheering and ‘coach’ feedback.

This process repeats until the number of rounds (as per level setting) are done or there are enough strikes to cause a ‘knockout’.

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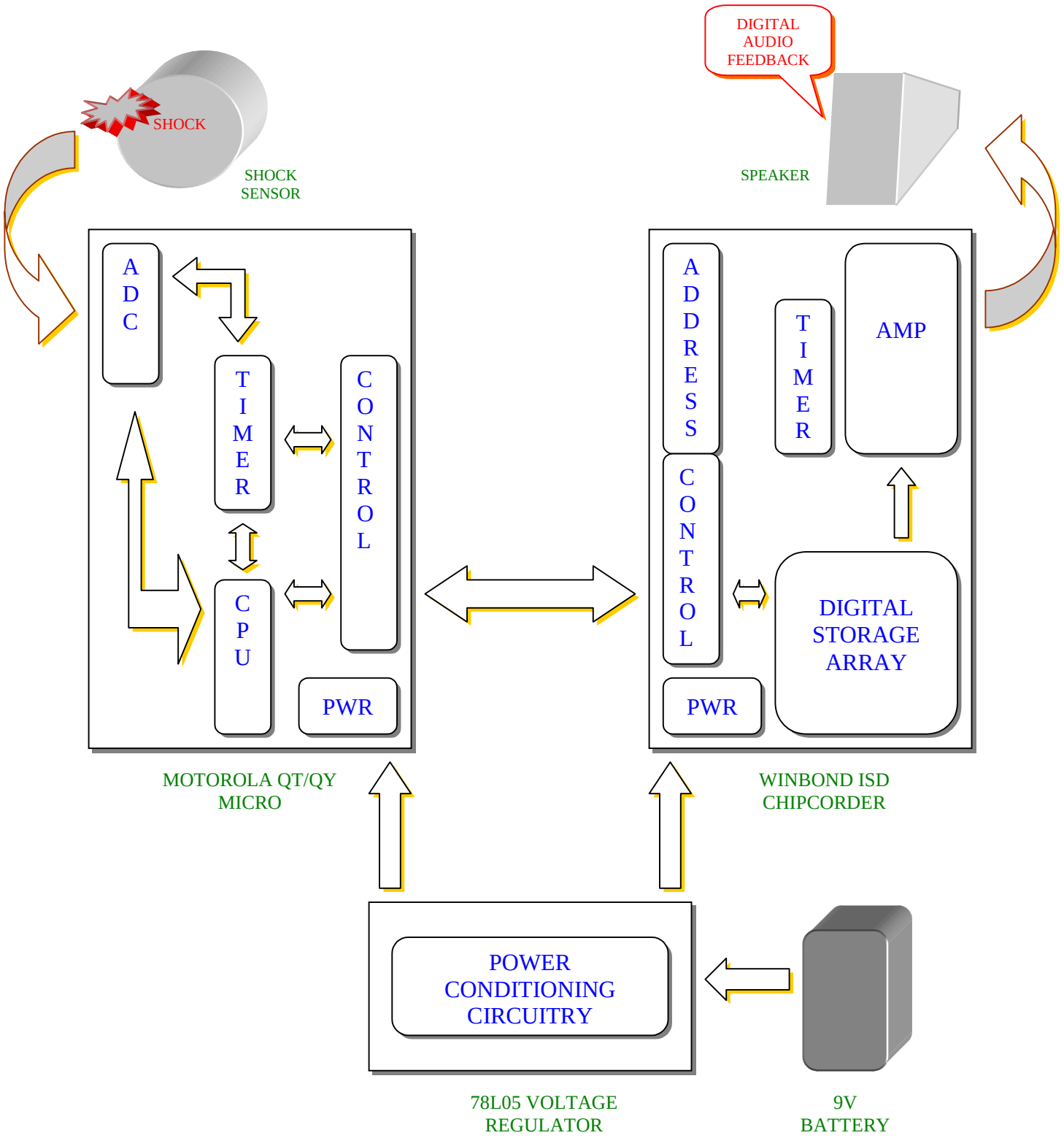

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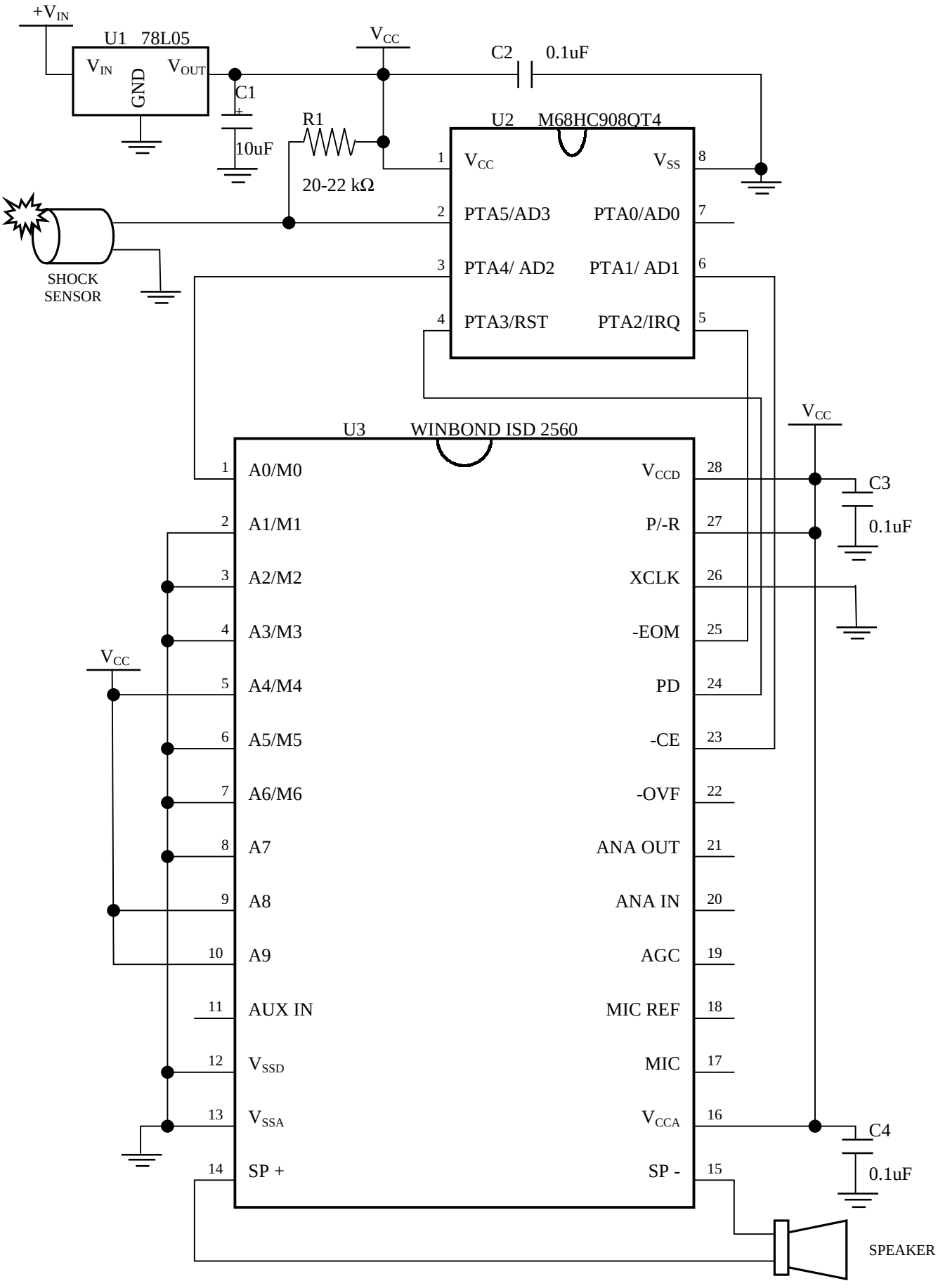

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