



Concept Overview



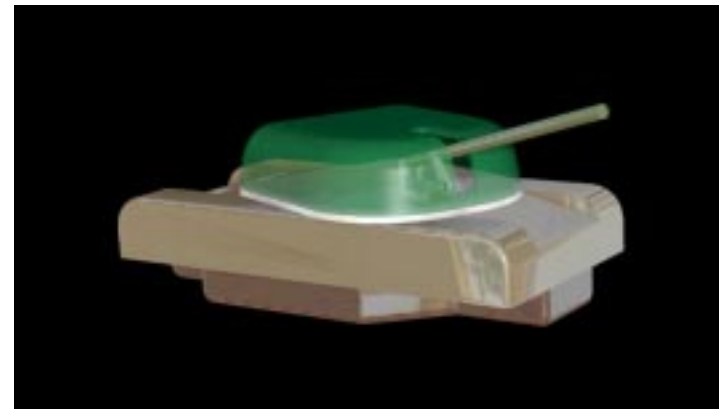
Design Concept

- All-terrain remote control vehicle with rotating turret water firing system

Toy Characteristics

- Aesthetic design inconsistent with realistic military vehicle appearance
- Toy target audience per marketing will be 8-12 year old males
- Interactive capabilities:
 - Remote controlled user interface
 - Play alone or with friends
 - Water sensing feature
 - Mechanized firing system
- Five to six pound weight with dimensions of twelve by fourteen inches

Preliminary aesthetic design





Features and Attributes



Rotating Turret Capabilities

- +/- 90° turret rotation
- Barrel elevation dismissed
- Small motor, as opposed to larger servo, driven rotation required 20mA

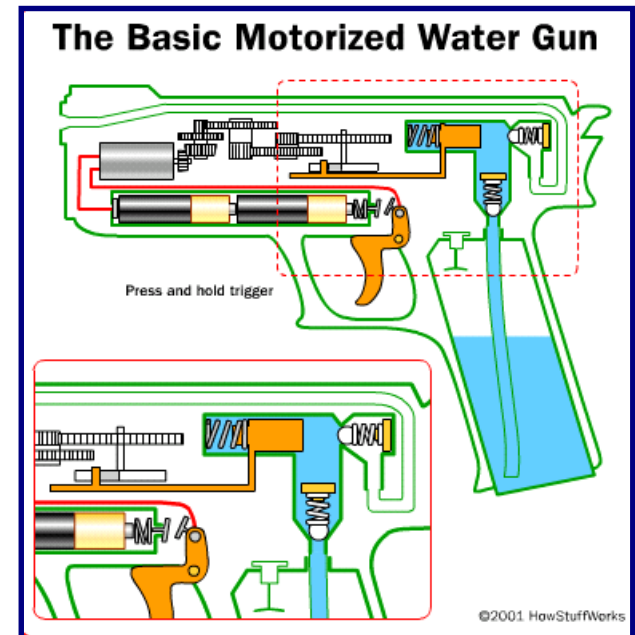
Pump hydraulic firing system

Mechanized firing system:

- Motor driven piston pump firing mechanism (21mA/1.5W)
- Motor speed and torque requirements of 197 rpm and 9 oz-in

Requirements:

- Set firing distance comparable to existing water firing systems of 20 ft
- Set fluid volume expelled per shot: 0.0073 in³, with possibility for expansion
- Set water reservoir size – water weight of 20 oz and 1.3 lb_m
- Continuous fire time determined to be between 12 and 15 minutes



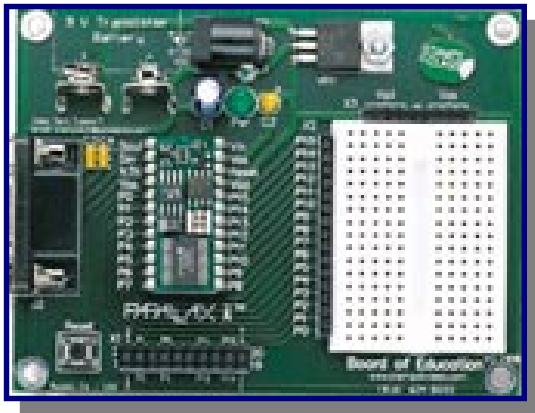


Embedded Intelligence



Water Sensing Mechanism

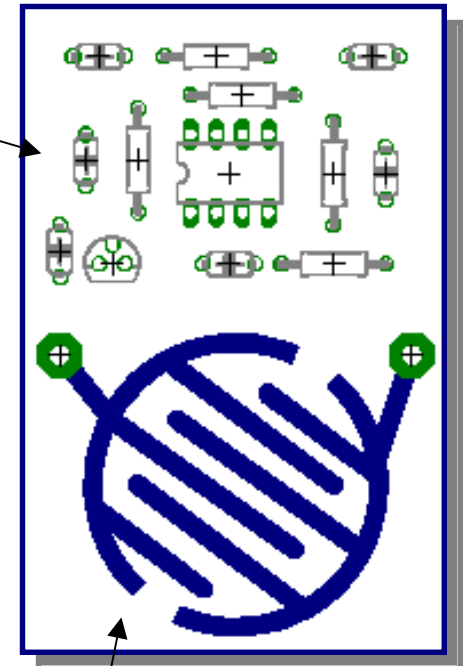
- Key intelligent feature of toy
- Can be turned on or off
- Sends signal to Stamp to:
 - Blink LED's for 5 sec.
 - Emit explosion sounds
 - Disable remote control



Stamp II

- Receive information from servo controller
- Using 6 pins
 - sensor (input)
 - firing mechanism (input)
 - relay (output)
 - speaker (output)
 - LED's for sensor (output)
 - LED's for firing mechanism (output)

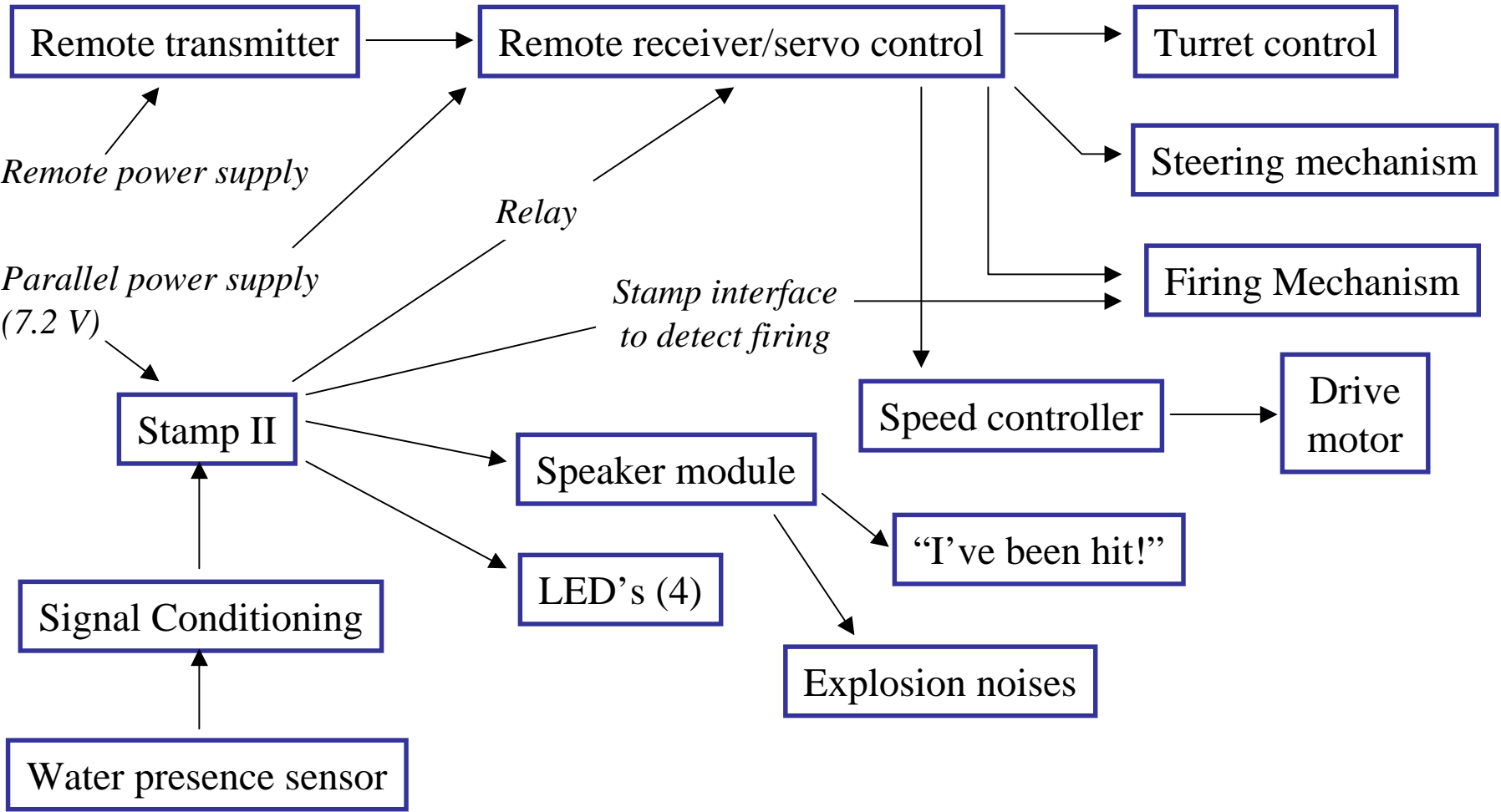
Water sensing circuitry



Gold-plated copper "fingers" of water sensor



Toy Circuit Schematic





Movement

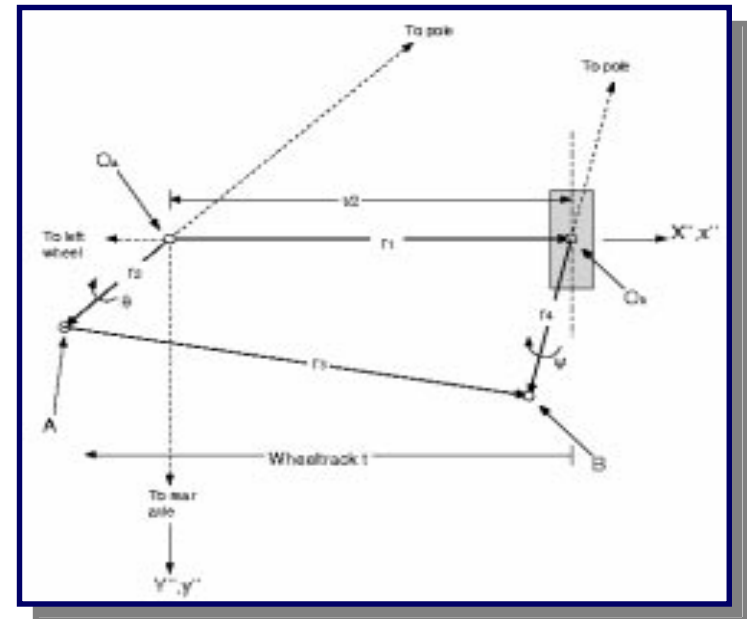


Motor Selection

- Motor selection based on speed, acceleration, weight, power consumption, and size
- Speed capability determined to be in the range of 3 to 4 ft/s
- Motor rotational speeds set around 200 to 300 rpm for wheel diameter of 3.5 in
- Studies to observe velocity profile trends for vehicle weight, wheel radius, and gearbox characteristics
- Power consumption will be more than for most RC vehicles due to increased weight
- Water reservoir depletion impact studies under way

Steering/Suspension Capabilities

- Four bar linkage driven bell-crank steering and double-wishbone suspension systems
- Curvature theory design for third order movement capabilities
- Turning radius set at three times the width of the vehicle: allowable for speed and rotating turret
- Servo driven steering consumes minimal power





User Interface Features



Remote Control

- Water proof in case child is squirted
- Inoperable when water sensing system “reads” wet
- Easy access firing trigger on front of remote similar to existing home video game systems
- Four channel remote control
 - Channel 1: drive motor
 - Channel 2: steering servo
 - Channel 3: turret rotation
 - Channel 4: firing mechanism





Potential Problems/Show Stoppers



Show Stoppers:

- No real “show stoppers” evident
- Problems have, however, surfaced

Potential Problems:

Potential to need larger motor than “traditional” RC vehicles

Chassis design for energy absorption

Difficulty with water sensing mechanism displaying varying resistance needs

- Signal conditioning research

Stamp sourcing current

- Final design may include different processor with more output current

Water/electrical system interface

- Seal electrical components, silicone coating of circuitry
- Exterior design for water run-off

Power consumption, battery size/life

- Selection of one as opposed to two drive motor scheme
- Small servo as opposed to large servo for steering mechanism drive



Project Plan



Time Schedule

- Continue prototype development aesthetic and functional deliverables – Completed by 11/22
- Experimentation and testing of prototype (11/22 – 11/29)
- Implement transition from feasibility to detailed analysis of shaft, steering, and suspension stress design
- Part order completions – Completed by 10/31
- Continued draft preparation (present – 11/15)
- Modification of bread boarded simulation circuit to operational circuit – Completed by 11/2
- Modifying Stamp II program – Completed by 11/5

Task Assignments

- Bertke/Juarez
- All
- Pilcher
- Peace
- All
- Peace/Juarez/Gennuso
- Peace/Gennuso