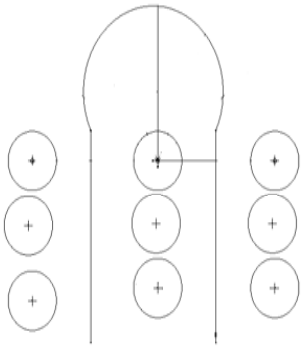
Mechanical Harvesting Enhancements

UF

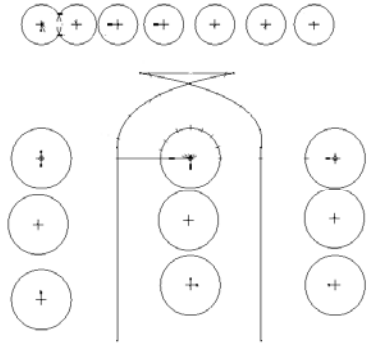
Dr. Tom Burks

- Autonomous Vehicle Headland Navigation
  - Detect approach of end of path with vision & ladar
  - Turn into the headland
  - Navigate the headland with vision & ladar
  - Execute U-Turn or Switch-back turn
  - Turn into the required row and resume row navigation
- Autonomous Vehicle in Open Field with Obstacles
  - DGPS based teach & repeat navigation
  - Basic Obstacle detection using Ladar
- Harvesting Equipment Utilization Modeling
  - Harvesting model with user defined grove parameters
  - User Interface Development
  - Execute preliminary Model feasibility analysis

U turn



Switch back turn



In-row Tractor Guidance

SICK Laser Radar

Video Camera

PC
2.4GHz

Sensor & guidance algorithms

Error

Monitor

Steering Control

Tern Mc + Amplifier (0-5V to 0-10V)

Analog

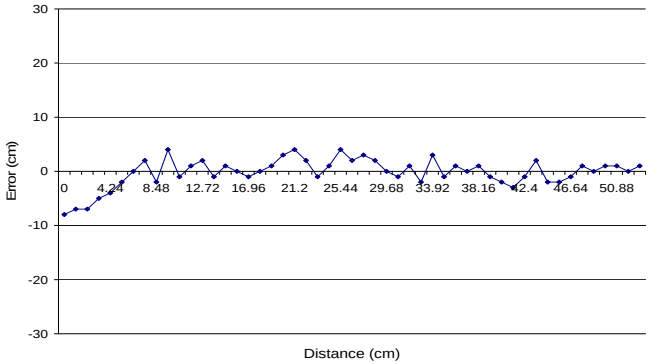
Electro-hydraulic Servo valve (0-10V)

Rotary Encoder on wheel shaft

Steering Angle

Test Track Navigation Error

Speed=3.1m/s

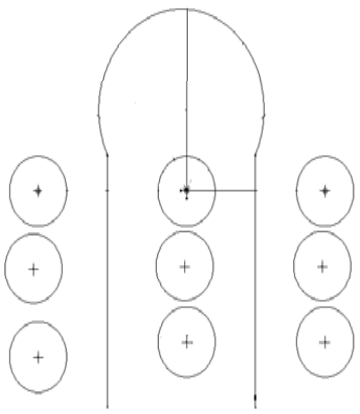


Speed (m/s)	Average Error (cm)	Stand Dev (cm)	Max Error (cm)	RMS Error (cm)
1.8	1.5	0.7	3	1.6
3.1	1.9	1	4	2.1

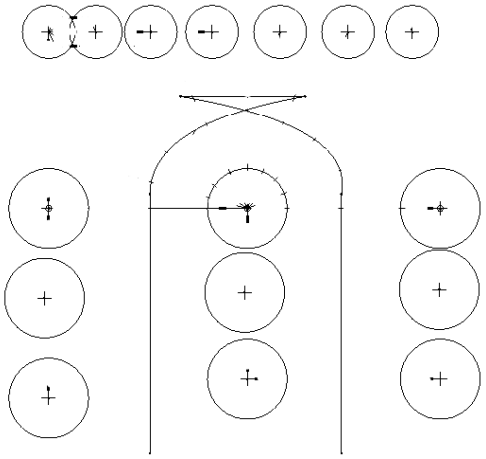
E-Gator Navigates Headland

- Detect approach of end of path
- Detect the end of the path
- Turn into the headland
- Navigate the headland
- Turn into the required row
- Begin to navigate the next row

U turn



Switch back turn



Turn	Avg. Dist. (m)	Max Dist. (m)	Min Dist. (m)
U Left	3.7	5.3	1.8
Switch back	2.7	3.4	2

E-Gator Open Field Navigation

- Navigating from one grove block to another or open fields
- Navigation: DGPS based teach and repeat
- Obstacle detection using Ladar