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Robotics Now!

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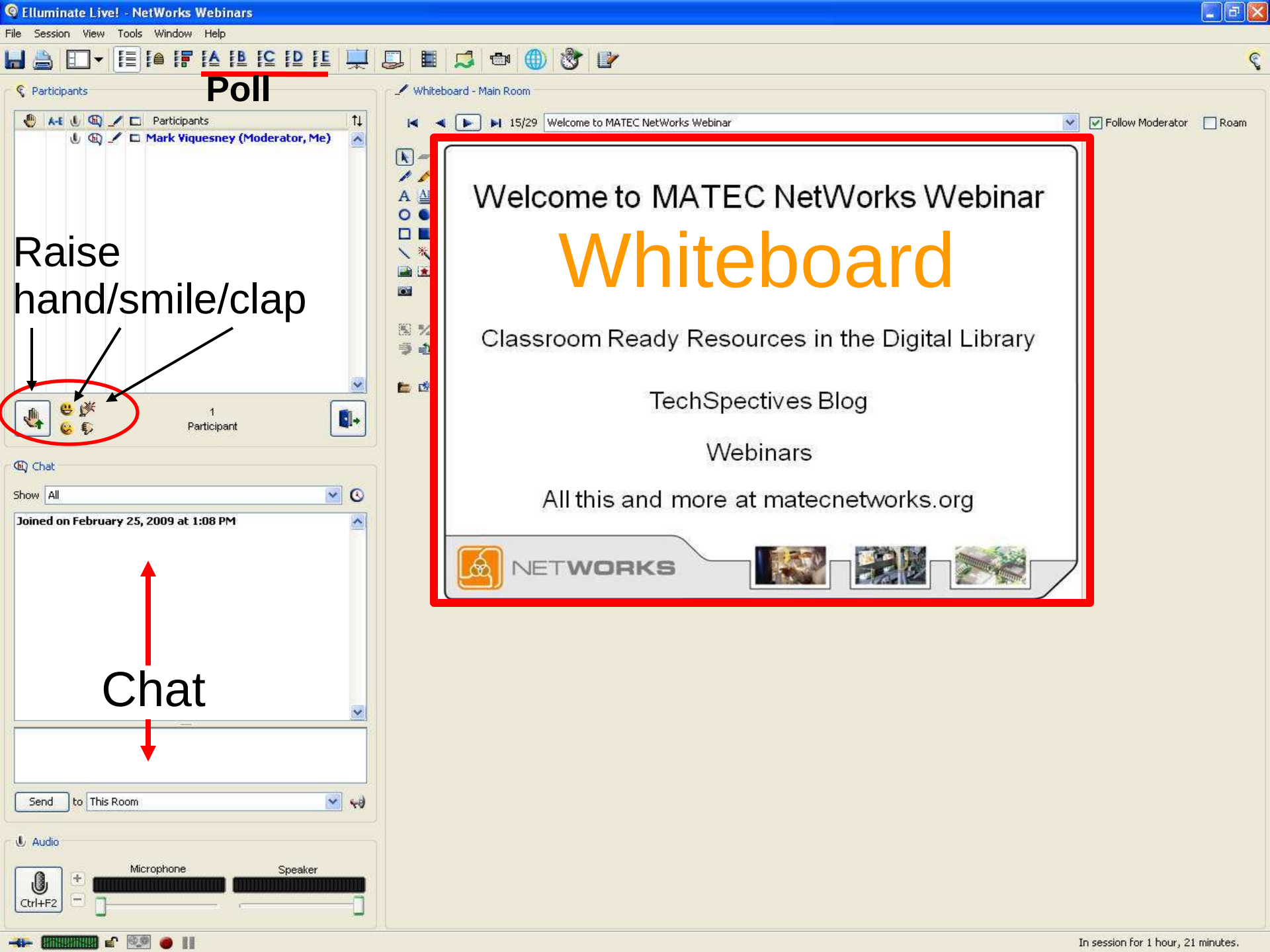
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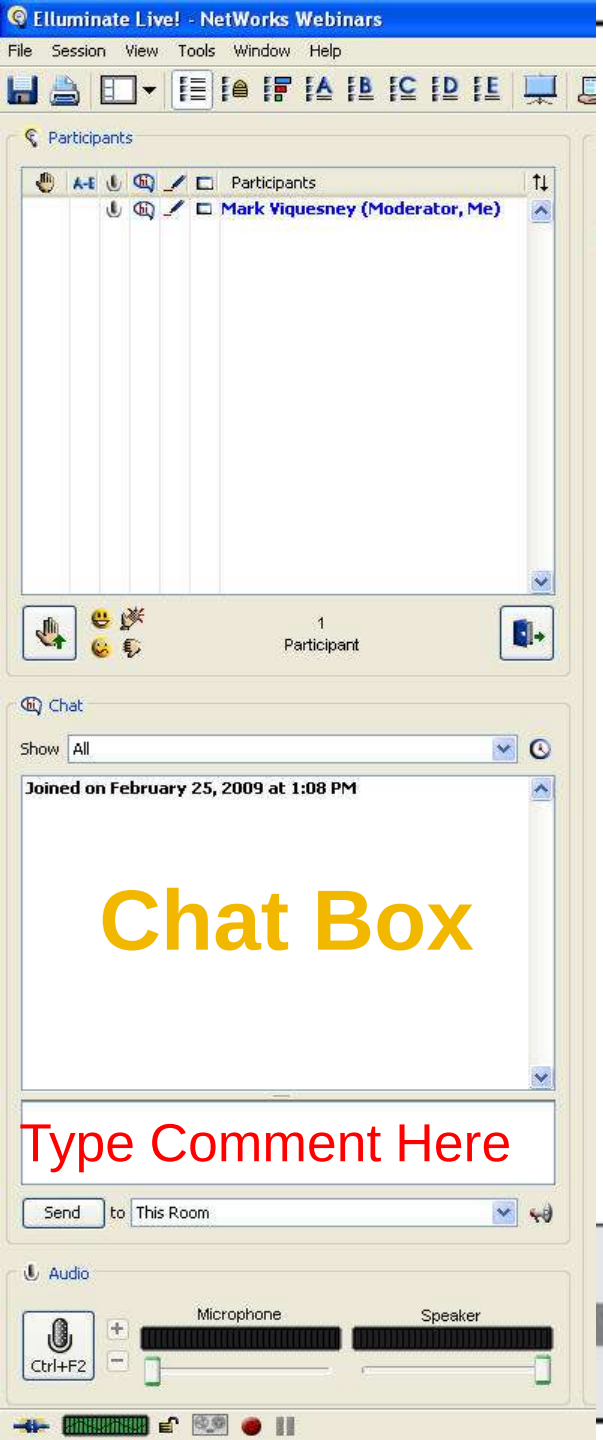

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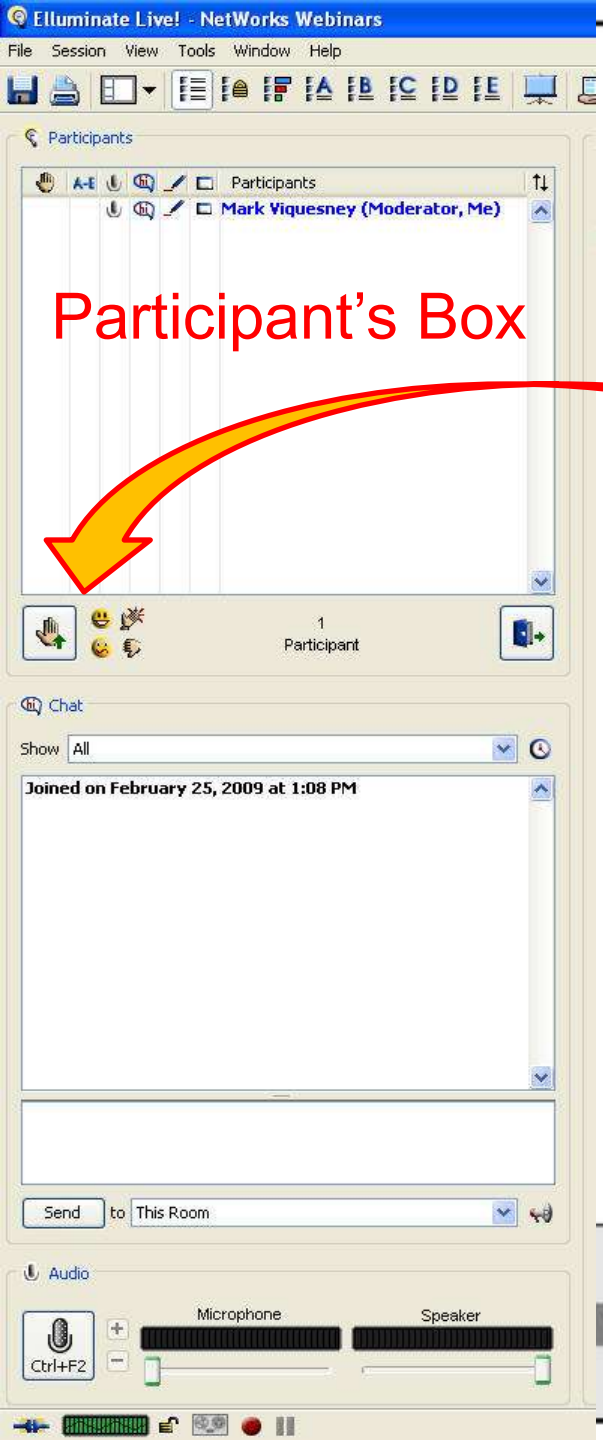

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NetWorks Webinar Presenters

Dr. Charles T. Muse
Executive Director for the National Robotics Training Center.
Southeastern Institute for Manufacturing and Technology at Florence-Darlington Technical College

Bill Bennett
Director, Training and Manufacturing for the National Robotics Training Center of Excellence

Mark Viquesney
Host

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The Robot Road Ahead

- "…a robot in every home by 2020"- Oh Sang Rok, South Korea, Ministry of Information and Communication, Manager of Intelligent Service Robot Project, April 2006

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The Robot Road Ahead

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- "1 million industrial robots throughout Japan by 2025"- 2007 technology roadmap from the Japanese Trade Ministry

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The Robot Road Ahead

- "…a robot in every home by 2020"- Oh Sang Rok, South Korea, Ministry of Information and Communication, Manager of Intelligent Service Robot Project, April 2006
- "1 million industrial robots throughout Japan by 2025"- 2007 technology roadmap from the Japanese Trade Ministry

- "Looking towards the year 2025, the Japanese government aims to become the world leader of service robots through the creation of autonomous robots."- Yumiko Myoken, Research and Development for Next Generation Service Robots in Japan, January 2009

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The Robot Road Ahead

- “there are similarities between the 1980s computer market and today's service robot market”- Bill Gates, Scientific American, January 2007

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The Robot Road Ahead

- “there are similarities between the 1980s computer market and today's service robot market”- Bill Gates, Scientific American, January 2007

- “By 2015 1/3 of US Army operational ground combat vehicles must be unmanned.” - Floyd D Spence National Defense Authorization Act 2001
- Since 2004, the Robotic Systems Joint Project Office has deployed more than 6000 unmanned ground vehicles

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The Robot Road Ahead cont.

- Robotics and robotic systems make up an emerging global industry in excess of $100B dollars

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The Robot Road Ahead cont.

- Robotics and robotic systems make up an emerging global industry in excess of $100B dollars
- Service robots for personal use worldwide are projected to increase by 160% over the next three years.

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The Robot Road Ahead cont.

- Recently, robots were used in the containment of the blown out oil well in the Gulf of Mexico off the Louisiana coast.

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The Robot Road Ahead cont.

- Recently, robots were used in the containment of the blown out oil well in the Gulf of Mexico off the Louisiana coast.
- According to the International Federation of Robotics, the world's service and industrial robot population has reached 8.6 million

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Big Dog Walking Robot

- Built by: Boston Dynamics
- Size of a small mule
- Weighs 240 pounds, carries 340 pounds
- Range 12 miles without refueling
- Walks, runs, climbs in mud, snow, ice, rocks
- Senses:
  - joint position
  - joint force
  - ground contact
- Using:
  - gyroscope
  - LIDAR
  - stereo vision system
  - And many other systems sensors

http://www.bostondynamics.com/robot_bigdog.html

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DARPA - Defense Advanced Research Projects Agency

- Unmanned cars operating autonomously in an urban environment
- Technologies used:
  - LIDAR
  - GPS
  - Radar
- Senses and responds to:
  - Other vehicles
  - Humans
  - Signs
  - Etc.

http://www.popsci.com/category/tags/darpa-urban-challenge

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LIDAR

- System of:
  - Laser
  - Optics
  - Receiver
  - Can include GPS
- Applications:
  - Meteorology
  - Law enforcement
  - Robotics
  - Etc.

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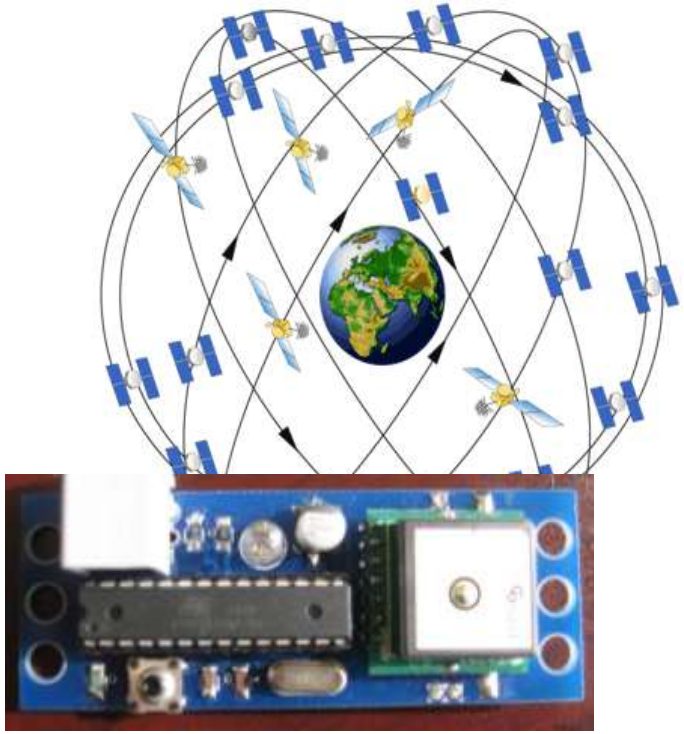
GPS – Global Positioning System

The real success today is the commercialization of the technology



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Open Source Accelerometer Equipped Glove

- A socially acceptable power glove for adults. Laced with accelerometers on each finger, the glove comes with an open source SDK that allows for it to control virtually anything– provided you can write the code for it.
- The glove can track hand movements in 3D space and relay that info back to the computer using the attached data board and USB cable.
- It's also possible to write drivers directly for the glove and use the raw data for more advanced applications.

http://acceleglove.com/default.asp
http://www.popsci.com/gear-amp-gadgets/article/2009-07/open-source-accelerometer-enhanced-glove-allows-infinite-control-possibilities

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The Importance of Robot Manufacturing

- Industrial Robotics: The majority are made and used overseas – The U.S. could fall further behind in terms of manufacturing capability

- UGVs: It is imperative that the U.S. maintain its competitive advantage for both defense and national security purposes

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Intelligent Systems / Robotics Workforce

Production Operators

Production Technicians

Research Technicians

Design Engineers

Research Scientists

FIRST Robotics
First Lego League

Well established engineering and robotics programs

Middle and High Schools
High School Diploma

Two Year Technical and Community College System
Certificate – Two Year Degree

Colleges and Universities
4 year - PhD
DARPA, NIST, OSD, DoD Funded

US Educational System

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Intelligent Systems / Robotics Workforce

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Certified Robotics Technician
AAS – Electro Mechanical / Intelligent Systems /Robotics (Associate Degree Program)

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US Educational System

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Development Process
Robotics Technician Program

- Job profiling of industry technicians
- DACUM
- Curriculum development
- Writing of training modules
- Incorporate MSSC base manufacturing modules
- Editing, graphics, production
- Program review
- Develop online modality

DUTIES		Tasks							
		1	2	3	4	5	6	7	8
A	**(A) Comply with Safety Procedures / Policies**	(A1) Attend Safety Orientation	(A2) Learn Safety Requirements for Work Area / Job	(A3) Obtain PPe / Safety Equipment	(A4) Obtain Necessary Certifications (NFPA 70E / Forklift)	(A5) Inspect Worlk Area for Hazards	(A6) Use Electrical Safety Equiment (e.g. Anti-Static Mats, Wrist Straps)	(A7) Use ESD Safe Tooling	(A8) Use Installed Safety Equipment (e.g. Eye Wash Stations)
B	**(B) Assemble to Manufacture Specs**	(B1) Receive Certification Training	(B2) Obtain Document Procedures Meeting Customer Requirements	(B3) Obtain Approved Workstation	(B4) Confirm Tool Calibration is Current	(B5) Obtain Required Tools	(B6) Draw Proper Parts from Supply	(B7) Assemble to Current Requirements / Specs	(B8) Maintain Parts Flow
C	**(C) Operate Robotic System / Station**	(C1) Check System Free of hazards	(C2) Perform Start-Up Safety Checks (e.g. E-Stops)	(C3) Power Up System	(C4) Install System Running Software	(C5) Make Mechanical Adjustments	(C6) Perfrom Functionally Test	(C7) Perform Vacuum Test	(C8) Perform Calibration
D	**(D) Conduct On-The Job (OJT) Training**	(D1) Complete "Train the Trainer" Training	(D2) Obtain Demo Materials as Training Aids	(D3) Conduct Classroom Training	(D4) Share Information on New Technology	(D5) Perform OJT Sequence	(D6) Document Training Completion	(D7) Receive Feedback from Trainer	(D8) Receive Feedback from Trainee
E	**(E) Keep Skills Current**	(E1) Maintain Re-Certification Requirements	(E2) Participate in "In House" Training	(E3) Conduct Cross Training	(E4) Rotate Company Assignments	(E5) Read Technical Publications	(E6) Conduct Internet Searches (e.g. Course, Research, Web Conferences)	(E7) Apply Customer Feedback (from Customer Needs & Visits)	(E8) Participate in Vendor Training
F	**(F) Verify Quality Workmanship**	(F1) Obtain Components	(F2) Establish Test Environment	(F3) Use Current Test Procedures	(F4) Use Current Operational Procedure	(F5) Check Calibration Limits	(F6) Gather Required Witnesses	(F7) Verify Pedigree of Component	(F8) Perform System Test Requirements
G	**(G) Integrate Computer Numeric Control (CNC)**	(G1) Learn Application of Robot	(G2) Review Assembly Drawings / Blueprints	(G3) Wire Electrical Components	(G4) Create Software / Hardware Interface	(G5) Demonstrate System E-Stops	(G6) Test System Functionality	(G7) Teach Robot (Initial Calibration)	(G8) Demonstrate System Functionality
H	**(H) Troubleshoot System / Component Failure**	(H1) Obtain Defective Component	(H2) Acquire Proper Documentation	(H3) Obtain Required Tools	(H4) Understand Function of Component	(H5) Determine "Root Casue" of Failure	(H6) Recreate Problem / Failure	(H7) Obtain Replacement Parts	(H8) Operate Robotic System / Station
I	**(I) Carryout Individual Projects**	(I1) Establish Project Goal	(I2) Create Project Team	(I3) Set Project Schedule	(I4) Establish Project Budget	(I5) Coordinate with Other Teams	(I6) Track Project Progress	(I7) Report Results / Data	(I8) Demonstrate Results
J	**(J) Perform Preventive Maintenance (PM)**	(J1) Establish PM Schedule	(J2) Obtain PM Procedure	(J3) Obtain Required Tools	(J4) Obtain Required Supplies	(J5) Check "Shelf Life" of Component Parts	(J6) Perform PM	(J7) Clean Component / System	(J8) Perform Post PM Operational Check
K	**(K) Perform Administratve Duties**	(K1) Comply with Company Rules / Policies	(K2) Adhere to Work Schedule	(K3) Follow Company Mission Statement	(K4) Report to Supervisor / Manager / Team Leaders	(K5) Maintain Required Documents	(K6) Read Company Notices and Bulletins	(K7) Participate in Department Meetings	(K8) Record Project Charge Time

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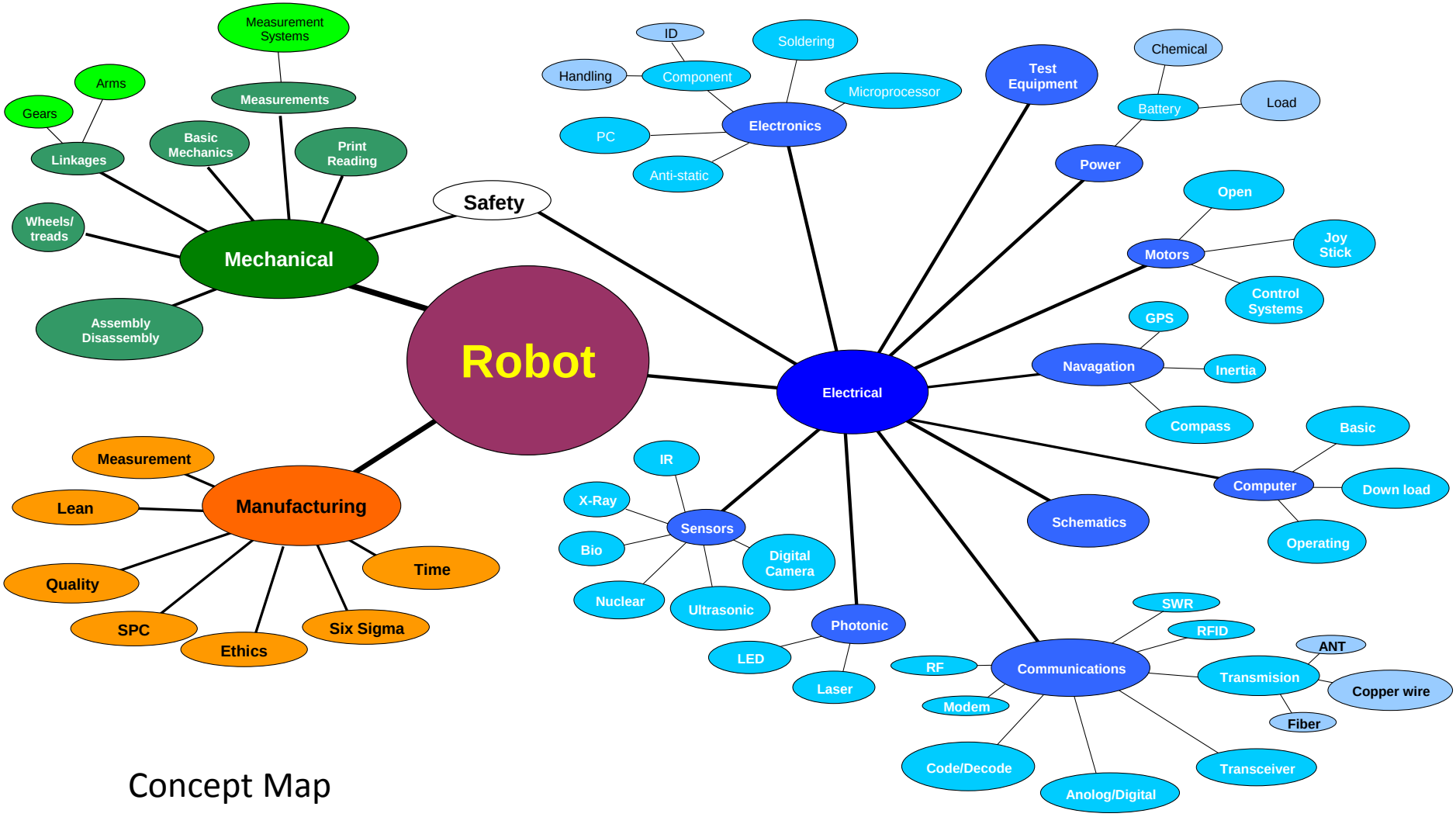

Concept Map

Curriculum Chart

Topic	Detail	Module #
Robotic Arm	Basic machines Center of gravity	MSSC OM12 MSSC OM13 MSSC OM14 MSSC OP1
Navigation device (GPS, inertia compass)	Overview Activity with GPS device Value/limitations of technologies	NRTC Mod 4
Cameras	Near infrared thermal infrared CCD Zoom Analog vs digital	NRTC Mod 3
Sensors	Infrared x-ray biological nuclear ultrasonic (overview options)	NRTC Mod 1 NRTC Mod 3
LED, light sources, lasers	Uses in robot for camera Alignment with mounting Distance sensing	NRTC Mod 3
Gears	ratio	MSSC OP3
Quality	Tolerances Measurement Lean manufacturing - six sigma (data charts) Non-conforming parts SPC Ethics	MSSC OQ3 MSSC OQ4 MSSC OQ7 MSSC OQ8 MSSC OQ9
Troubleshooting	Electrical systems Mechanical systems	MSSC OM1 MSSC OM2 MSSC OM5 MSSC OM6

Curriculum Chart

Topic	Detail	Module #
Electronics	Printed circuit board component handling component identification basic electronics AC/DC diagnostic testing equipment anti static soldering de-soldering	MSSC OM1 MSSC OM2 MSSC OM3 MSSC OM4
Control systems (joystick)	Purpose; test; troubleshoot; control and feedback Closed vs open loop system	NRTC Mod 1
Operating systems (software)	Basic computer skills Microprocessors –basic function	NRTC Mod 1
Power Source (battery)	Chemistry safety Test under-load	NRTC Mod 1
Motors and motor control systems (electrical)	Microprocessors	MSSC OM15
Basic Mechanics and Mechanical systems		MSSC OP1 MSSC OP2
Communication systems	Transceiver RFID SWR (standing wave ratios) Analog vs digital RF Electrical signal over copper Pulses of light over fiber Modulation vs demodulation Coding & decoding Antennas	NRTC Mod 2
Mechanical linkages		MSSC OP2

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Robotics Production Technician Certificate

These Courses Can Be Offered Credit or Non-Credit

Course	***Credit Hours***
Tier One	
Manufacturing Skill Standards Council - Certified Production Technician	
Principles of Safety (MSSC-CPT)	3
Principles of Maintenance (MSSC-CPT)	3
Principles of Quality & Continuing Improvement (MSSC-CPT)	3
Principles of Manufacturing Processes & Production (MSSC-CPT)	3
Subtotal	12
Tier Two	
National Robotics Training Center Certified Robotics Production Technician	
Manufacturing Workplace Skills	3
Computer Systems and Sensors (NRTC-CRPT)	3
Communications Systems (NRTC-CRPT)	1
Cameras, Photonics, and Light Sources (NRTC-CRPT)	1
Robot Mobility and Navigation (NRTC-CRPT)	1
Concepts of Lean Manufacturing (NRTC-CRPT)	3
Subtotal	12

Total Credit Hours 24

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Associate of Arts Degree

with a concentration in

Robotics Production Technology

		Credit Hours
General Requirements		
Communication		9
Humanities and/or Social Sciences		12
Mathematics		6
	Subtotal	27
Concentration in Robotics Production Technology		
* Computer Systems, Sensors, Communication, Photonics, Navigation		
** Safety, Quality, Mfg. Processes, Maintenance, Lean Mfg.	Subtotal	24
Other Requirements		
Humanities and/or Social Sciences and electives	Subtotal	15
	Minimum Credit Hours	66

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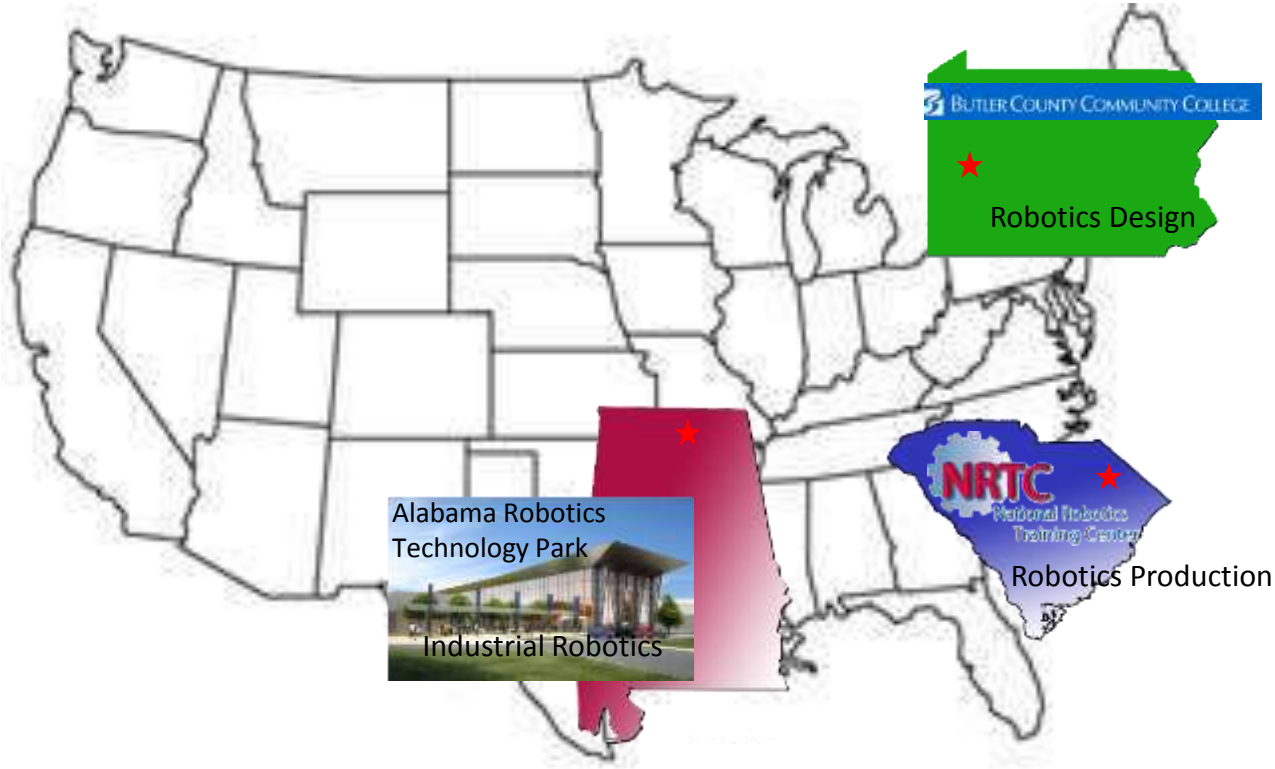
Potential Virtual National Center



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Certified Robotics Production Technician

Assessment Process

- Stacks on the MSSC Certified Production Technician (CPT)
- National Robotics Training Center Certified Robotics Production Technician
  - Three assessments
  - CPT certification required

The NRTC - CRPT certification stacks on the MSSC - CPT certification

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Certified Robotics Production Technician

Program Marketing

- Industry Support
  - AUVSI
  - NAM-MI
  - NDIA
- Availability to Military Personnel
  - Council of College and Military Educators
  - Army, Air Force, Navy, Marine Corps, National Guard, Coast Guard – ESO's
- Two Year College System
  - NSF HI-TEC
  - Community/Technical Colleges
  - Economic Clusters
  - Association of Career and Technical Educators

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April 9th	CONVERGING TECHNOLOGIES CAREER EXPLORATION
May 14th	REVITALIZING ELECTRONICS PROGRAMS
June 10th	RECRUITING DIVERSE POPULATIONS

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Energy Utilization	09/11/09	VIEW
Teaching and Learning with i-Technologies	08/14/09	VIEW
Developing Strong Evaluations for ATE Projects Part II	07/10/09	VIEW
Developing Strong Evaluations for ATE Projects Part I	07/09/09	VIEW
Learning Objects: What are they? How do I use them?	06/18/09	VIEW
Electronics 2010: eSyst Update 6	05/15/09	VIEW
Making Your Program Flexible	04/17/09	VIEW

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