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RATA project report

Robot assisted test system concepts and their main characteristics

Contents

1. Introduction

Not all robot assisted test systems are equal. Systems created for demonstration or research purposes need to be different than systems targeted for serious day-to-day testing. Therefore, we need understand the main differences between the concepts and in the design of system make decisions about the concept of the system under development and its goals and main features.

This document outlines the main characteristics of some essential robot assisted test system concepts.

2. The main robot assisted test system concepts

The main concepts assessed here are:

- Concept demo system. Its purpose is to show how robots can execute devices and applications and how we collect data from that. Users can be research and educational institutes and system vendors. Experts and sometimes managers who think they can use the system! Typical environment: meeting room. Business goal: make people understand and desire robot assisted system. Get them to support, fund and buy such systems.
- Research system. A system used by researchers and test system developers to develop new algorithms and similar for future production systems. Users are testing technology experts. Typical environment: research lab, researcher's room. Business goal: Let the researchers experiments with anything they desire and use the system any way they like.
- Targeted production system. A system for day-to-day heavy-duty testing in some testing type, with quite stable style of testing. A workhorse that runs by itself for long durations. Users are professional testers. Typical environment: test lab. Business goal: Let QA run special tests, such as long term tests in simple, efficient way.
- Generic, agile production system. A system with more adaptability, for example for a team's use with advanced requirement for actuation. Typical environment: team room or test lab. Users are professional testers. Business goal: Let a team or tester run any automated tests easily and efficiently with no need for instrumentation.
- Vocational education system (for testers). A system used in teaching students how to use robot assisted test systems that they will meet later in companies (or will be ramping up). Typical environment: teaching lab. Users are students, teachers and laboratory technics (maintenance). Business goals: Give students the necessary knowhow on the system to start using or implementing them from ready-made manufacturer-packaged systems.
- Engineering education system. Used in for example university courses in teaching how to control robots in testing. Typical environment: teaching lab. Users are students, teachers and laboratory technics (maintenance). System may also be used for research. Business goal: Make learning interesting, make students understand the design and possibilities of robotic systems.
- Toy system. Used by hackers and hobbyists for personal joy. Typical environment: home. Users: people who love gatgets. Experiments may often be videoed and published in YouTube. Users will join a community if one exists. Business goal: Get visibility for the systems, make the available and familiar for wider audiences. Get teens interested in robotics.

Of course this is just one classification and the real requirements may vary case by case.

3. Essential design characteristics of the main robot assisted test system concepts

The following table lists some of the most unique and essential design characteristics of the main robot assisted test system concepts. The minimum viable system is a concept often used in Lean Startup culture (often in the form Minimum Viable Product, MVP) that refers to the minimum system that "gets things done". It is the development or purchasing state of a product that allows for assessing it, doing experiments with it. finding out what customers value and planning next steps in its utilization and development roadmap.

Table 1.Characteristics of the main robot assisted test system concepts.

Concept	Most important characteristics	Things that are not so essential	Include in minimum viable system	Include in ideal / maximum system (on top of MVS)
Concept demo system	Immediate understandability to visitor Simple monitor (with big font) that shows what is going on and what is being logged Can run a use case that everyone understands (do something with one application) Fool-proofness Desirability, friendliness, hi-tech sex appeal Portability	Robustness and reliability Accuracy Speed Real testing ability	Simplest hardware package; minumum number of wires… Simple test runner Packaged example tests with SUT specifications Simple instructions / scripts for using	Maximum WOW effect Show all variations in test arrangements (all need not work)
Research system	Everything open – APIs, databases Modular design, changeability of components (e.g. camera, robot mechanics) Linux & Windows	Robustness and reliability Speed	All the basic things API documentation Source code & documented developent environment for robot control / imaging components	
Targeted production system	Ability to do real testing efficiently Robustness and reliability Reliable OCR & icon recognition Speed Good, fast debuggability Remote monitoring Linux & Windows	Desirability Size Noise level	Basic hardware (robot, workstation interface or integrated laptop or similar) Test running software Training material	Device handling systems File format converters for test models Integrated modeling tools Integrated failure debugging tools Remote radiators

Concept	Most important characteristics	Things that are not so essential	Include in minimum viable system	Include in ideal / maximum system (on top of MVS)
Generic, agile production system	Ability to do real testing efficiently Robustness and reliability Reliable OCR & icon recognition Speed Accuracy Good, fast debuggability Speed of configuration & adaption to new testing needs Easy adaptation to new targets Easy adaptation to new test gerenation / modelling tools Expandability Low noise level Linux & Windows		Basic hardware (robot, workstation interface or integrated laptop or similar) Test running software Test management software Rapid modelling tool Training material	Device handling systems File format converters for test models Integrated modeling tools Integrated failure debugging tools Advanced modeling tools Configuration management system / integration to it Integration to test management systems
Vocational education system (for testers)	(See the production systems above) Not too easy… students need to learn about the problems too	(See the production systems above)	(See the production systems above) Teaching material	None / Varies
Engineering education system	(See the research system above) Low cost Not too easy… engineers need to learn about the problems too	(See the research system above) Robustness and reliability	(See the research system above) Teaching material	None / Varies
Toy system	(See the research system above) Fun factor Very low cost (like a camera or high end smartphone)	(See the research system above) Long life Real testing ability	(See the research system above) Web community	(See the research system above) Web store for accessories Integration to other things in gatget culture, such as Raspberry Pi for control