Embedded systems notes pdf





By patel vijayLecturer At 6.5K ViewsType: NoteRating: 4Handwritten98 Pages3 TopicsGTUThat hand written notes will help to all final year diploma and degree students for help in arduino atmega controllers and basic embedded systems topics with previous year questions paperBy Verified Writer3.0K ViewsType: PYQRating: 08th Semester - 2017BPUTPrevious Year Questions of Embedded System - ES of BPUT - bput, B.Tech, AEI, 2017, 8th SemesterBy Verified Writer1.9K ViewsType: PYQRating: 08th Semester - 2010BPUTPrevious year Exam Questions pyg for Embedded System - ES - BPUT 2010 8th Semester by Sibananda AchariBy Benny ChetanStudent At 1.9K ViewsType: NoteRating: 472 PagesMECBased on the OU syllabus of Principles of Embedded Systems (PES) Course: B.TechGroup: Embedded System DevelopmentEmbedded System, ES Study Materials[®] Copyright 2020. All rights are reserved. 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Also, see my other content distribution sites: Favorite Talks and Webinars 2020: WAISE: Positive Balance of Confidence for Self-Driving Care Deployment (6 Minutes) / Slides 2020: WAISE: Positive Balance of Confidence for Self-Driving Care Deployment (6 Minutes) 15 mins) / Slides 2020: Reliability Inside Out Testing (10 minutes - SA; Beginning at 1:50 / Presented by Dr. Milda zizithe 2020: Safety Performance Incidators (SPIs) for self-driving cars (21 minutes) / Slides 2020: AVS: UL 4600 (20-minute version) / Slides 20202: AVS: UL 4600 (5-minute version) / Slides 20202: AVS: UL 4600 (pening presentations (11 minutes) 2020: AVS: UL 4600 (pening presentations (11 minutes) 2020: AVS: UL 4600 (pening presentations) / Slides 20202: AVS: UL minutes) / Slides 2019 : Safe Systems Summit 2019, The big picture for self-driving car safety (standards) 2019: SafeComp 2019, Autonomous Vehicles Meet the Physical World 2019: SSS 2019, Edge Cases and Autonomous Vehicle Safety 2018: SafeAI 2019, How Many Operating Design Domains, Objects and Events? 2018: Tech.AD 2018, Autonomous Vehicle Testing and Safety 2018: OESA 2018, Potential Improvement in Autonomous Vehicle Safety: Less Hype, More Data 2018: Safecomp Paper, Safety Practices Vs. Accepted Principles 2018: WAISE Workshop Basic, Autonomous Vehicle Safety Technical and Social Issues 2018: ICSE, Robustness Testing Autonomy Software 2018: SAE WC, To the Framework for Highly Autonated Vehicle Safety Checks 2017: Tech.AD 2017; High Autonomous Vehicle Check: It's More Than Just Road Testing 2017: AV17, challenges and solutions in autonomous vehicle testing 2016: ISSRE, guality of built-in system software: Why is it so often scary? What can we do about it? 2014: ASTAA Project: Software Testing and Time Monitoring of Autonomous Vehicle Launch 2014: Toyota Unintentional Acceleration Case Study (YouTube) 2013: FAA, CRC and Checksum Project Final Presentation 2011: ESC/SV, Avoiding Top 43 Built-in Software Risks 18-642: Built-in Software Engineer Safety Code. (Last update fall 2020.) YouTube Video die from their software; Considering the worst case; Designing for safety purposes Security issues Industrial control as targets; Designing for security Testing is not enough Fiat Chrysler Jeep hack; Ford Mytouch update; The quality of the Toyota UA code; Heart bleeding; Nest thermostats; Honda UA recall; Samsung keyboard error; Hospital infusion pumps; LIFX LIGHT bulbs; German steelworks to crack; Ukraine power to hack; SCADA attack data; Shodan; Traffic control vulnerability of hydroelectric power plants; zero day shopping list 2 Course Administration No Video 3 Processes software development SW process (49 min) Waterfall; Swiss cheese model; Lessons learned in the field of software V model; Design vs. code Flexible for the built-in 4 Code Style for Humans (15 min. good code hygiene; Avoiding premature optimization; coding style 5 Code Style for compilers (21 mins) Pitfalls and problems with C; use of guidelines and language analysis tools; wise use of language (strong input); Mars climator; deviations - outdated code 6 Peer Reviews; checklist review; example; economics review; exa rules for good requirements; problem requirements; ambiguity 8 Global and static variables; avoiding and removing global 9 Spaghetti (18 mins) McCabe Cyclomatic Complexity (MCC); SCC; Spaghetti Factor (SF) 10 Toyota UA Sample Research Toyota UA (60 min) Example Toyota UA 11 Stack Overflow Stack Overflow (8 min) Stack Overflow Mechanics; Memory protection Avoid repetition of 12 SW Architecture Architecture Architecture and HLD (15 min) High-level design (HLD); Boxes and arrows; Sequence charts (SD); State of SD Relationships 2011 Health Plan Chart 13 Statecharts (19 min) Statecharts (19 min) Statechart Items; An example of a state charter; Implementation of statechart 14 Traceability Tracking (11 mins) Tracking throughout the V; Examples Best Practices 15 Software Testing Review Software Testing Review (20 mins) Smoke Testing, Research Testing; Methodical coverage of the tests; Testing types Testing philosophy Coverage Testing types Testing the white box Specific testing strategies MCDC coverage; Unitary Testing (11 mins) Approaches to integration testing; Tracking SD integration tests Testing network messages Using SD systems to create unitary tests 18 System-Level Test (18 min) First error history; Effective test plans Testing won't find all the bugs. F-22 Raptor date line error; Farm bugs; Risks of Bad Software 19 Race Conditions Race Conditions (21 mins) Therac 25: An example of the state of race Disconnection interrupts; mutex; Lock time Priority inversion Priority inheritance Mars Pathfinder 20 SSA does not test (13 min) elements of the SSA; Audits The SSA as a coaching staff; The cost of fixing defects during the project cycle 21 life cycle CM (19 min) A400M accident; Version management Configuration management Long LifeCycle 22 --- --- The safety theme of self-driving cars (not publicly available) 23 Maintenance (15 min) Error-fixing cycle; Error priorities Maintenance as a high-cost driver Technical Debt 24 Key Metrics (13 mins) Tester to Developer Attitude; Code performance Effective expert assessment 25 Date/Time (26 mins) Saving time; Time terminology Clock synchronization Time zones DST; Local time; Sunrise/sunset; Mobility and time Date line GMT/UTC; Leap years; leap seconds Time transfer The zuke leap year is a mistake; Internationalization. 26 Floating Points Pitfalls Floating Points Pitfalls (17 mins) Floating point formats; Special values NaN and robots; Round-round errors Patriot Missile Misha 27 Security Review Security Review Security Review Security Review (16 mins) Defense in depth; Safety principles Safety culture Challenger misfortune; Reliability reliability values NaN and robots; Round-round errors Patriot Missile Misha 27 Security Review Security S Reliability serial and parallel An example of reliability calculation Other aspects of the reliability of 29 critical critical systems (21 minutes) Security Integrity Levels (SIL); Bhopala; IEC 61508; Exposition Fleet 30 Security Plan Safety Plan (26 min) Elements of the Security Plan; Approaches to functional security Hazards and risks Security and security requirements FMEA; FTA; Security and security requirements FMEA; FTA; Security Case (GSN) 31 Single Failure points (17 mins) Toyota UA one point of failure; Multichannel pattern Monitor pattern; The safety gate pattern Correlated and accumulated malfunctions 32 Safety requirements (17 mins) Determining security requirements; Security envelope Doer/Checker Pattern 33 Critical Isolation of various TIL, mixed sil jamming sources; Mitigation of cross-SIL interference; Isolation and safety CarShark hack 34 redundancy management redundancy management (20 min) Bellingham WA petrol pipeline mishap; Redundancy for availability Redundancy (PMR) 2-of-3 pattern; Double pattern 2 of 2; High-SIL Doer/Checker template; Diagnostic Efficiency and Proof Trials 35 Security Architecture Patterns Safety Patterns Architecture Patterns (42 mins) Additional lecture with more details on templates: low SIL; Self-diagnosis; Section Failure Voting Don't be silent. Double 2-of-2; Ariane 5 Flight 501; Not quiet patterns (low, high, mixed SIL); High availability of the mixed SIL 36 Data Integrity Data Integrity (29 min) Fault Sources Soft errors Hamming's distance; Parity; Mirror image; SECDED; Checking CRC 37 Cryptography (33 mins) Confusion and diffusion; Caesar's cipher; Frequency analysis A mystery; Lorenz and Colossus; DES; AES; Open-key cryptography Safe hashing Digital signatures Certificates PKI; encryption compared to signing up to update the firmware elements of the 38 Security Plans Security Plans Security Plans Security requirements Threats Vulnerabilities Mitigation; Checking 39 security threats --- Stuxnet; The motivation of the attack Attacker threat levels DirectTV piracy; Operational environment Porous firewalls The Davis Besse incident; BlueSniper rifle; Integrity Authentication Secrecy Privacy; DoS/DDos; Activating the function St. Jude pacemaker recalls 40 security vulnerabilities --- operation against an attack; The kettle of spam bot; Weak passwords Password master The length of the cryptographic key; Attack of the Mirai botnet; Crypto errors LIFX visited again; Karshark again; Chip peeling; Hidden functionality Fake systems Cloud-connected devices Built-in Attacks 41 Security Mitigation Check --- password; The least privileged Jeep firewall hack; Safe upgrade Safe download encryption against signing again; Infiltration testing Code analysis Other approaches to security Rubber Hose Attack 42 Security Pitfalls (24 mins) Konami code; Security Hotel USB lock hack; The Kirkhoff Principle; WPA hospital installation hack; DECSS; Attack on the tram in Lodz; Proper use of cryptography zero-day exploits; Snake oil safety; The realities of system firewalls Infotainment and Firewalls Infotainment and Firewalls zombie road sign hack NOTES: Overall the videos. You have to watch the entire playlist to see all the content for the lecture. You can play some of these videos with 1.2x to 1.5x acceleration if you are a fluent speaker. (Usually the gear/settings icon will allow you to do so in the playback window.) Live of course the site ece642/ perhaps some later lectures. Please see copyright notice 18-348: Built-in System Engineering Microcontroller Hardware, Software, B/O, Coding Methods, with 9S12 microcontroller coverage. (Last taught in spring 2016.) 18-649: Distributed systems, built-in networks, critical systems. (Last taught fall 2015.) Additional reading list. (Note that local links are probably nonfunctional.) 18-548: Hiearchy memory hierarchy from cache to virtual memory. (The last one taught in the fall of 1998.) Copyright Notice: These materials for personal use is acceptable without additional permission. 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