

# IPONE SATELLITE DIRECT APP

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## Automatic Solar Tracking Sun Tracking Satellite Tracking

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**AUTOMATIC SOLAR TRACKING SUN TRACKING :** THIS BOOK DETAILS AUTOMATIC SOLAR-TRACKING, SUN-TRACKING-SYSTEMS, SOLAR-TRACKERS AND SUN TRACKER SYSTEMS. AN INTELLIGENT AUTOMATIC SOLAR TRACKER IS A DEVICE THAT ORIENTS A PAYLOAD TOWARD THE SUN. SUCH PROGRAMMABLE COMPUTER BASED SOLAR TRACKING DEVICE INCLUDES PRINCIPLES OF SOLAR TRACKING, SOLAR TRACKING SYSTEMS, AS WELL AS MICROCONTROLLER, MICROPROCESSOR AND/OR PC BASED SOLAR TRACKING CONTROL TO ORIENTATE SOLAR REFLECTORS, SOLAR LENSES, PHOTOVOLTAIC PANELS OR OTHER OPTICAL CONFIGURATIONS TOWARDS THE SUN. MOTORIZED SPACE FRAMES AND KINEMATIC SYSTEMS ENSURE MOTION DYNAMICS AND EMPLOY DRIVE TECHNOLOGY AND GEARING PRINCIPLES TO STEER OPTICAL CONFIGURATIONS SUCH AS MANGIN, PARABOLIC, CONIC, OR CASSEGRAIN SOLAR ENERGY COLLECTORS TO FACE THE SUN AND FOLLOW THE SUN MOVEMENT CONTOUR CONTINUOUSLY (SEGUIMIENTO SOLAR Y AUTOMATIZACIÓN, AUTOMATIZACIÓN SEGUIDOR SOLAR, TRACKING SOLAR E AUTOMATICO, AUTOMATICO SEGUIDOR SOLAR, INSEGUIMENTO SOLARE, INSEGUISTORE SOLARE, ENERGIA TERMICA, SOLE SEGUITO, POSIZIONATORE MOTORIZZATO) IN HARNESSING POWER FROM THE SUN THROUGH A SOLAR TRACKER OR PRACTICAL SOLAR TRACKING SYSTEM, RENEWABLE ENERGY CONTROL AUTOMATION SYSTEMS REQUIRE AUTOMATIC SOLAR TRACKING SOFTWARE AND SOLAR POSITION ALGORITHMS TO ACCOMPLISH DYNAMIC MOTION CONTROL WITH CONTROL AUTOMATION ARCHITECTURE, CIRCUIT BOARDS AND HARDWARE. ON-AXIS SUN TRACKING SYSTEM SUCH AS THE ALTITUDE-AZIMUTH DUAL AXIS OR MULTI-AXIS SOLAR TRACKER SYSTEMS USE A SUN TRACKING ALGORITHM OR RAY TRACING SENSORS OR SOFTWARE TO ENSURE THE SUN'S PASSAGE THROUGH THE SKY IS TRACED WITH HIGH PRECISION IN AUTOMATED SOLAR TRACKER APPLICATIONS, RIGHT THROUGH SUMMER SOLSTICE, SOLAR EQUINOX AND WINTER SOLSTICE. A HIGH PRECISION SUN POSITION CALCULATOR OR SUN POSITION ALGORITHM IS THIS AN IMPORTANT STEP IN THE DESIGN AND CONSTRUCTION OF AN AUTOMATIC SOLAR TRACKING SYSTEM. THE CONTENT OF THE BOOK IS ALSO APPLICABLE TO COMMUNICATION ANTENNA SATELLITE TRACKING AND MOON TRACKING ALGORITHM SOURCE CODE FOR WHICH LINKS TO FREE DOWNLOAD LINKS ARE PROVIDED. FROM SUN TRACING SOFTWARE PERSPECTIVE, THE SONNET TRACING THE SUN HAS A LITERAL MEANING. WITHIN THE CONTEXT OF SUN TRACK AND TRACE, THIS BOOK EXPLAINS THAT THE SUN'S DAILY PATH ACROSS THE SKY IS DIRECTED BY RELATIVELY SIMPLE PRINCIPLES, AND IF GRASPED/UNDERSTOOD, THEN IT IS RELATIVELY EASY TO TRACE THE SUN WITH SUN FOLLOWING SOFTWARE. SUN POSITION COMPUTER SOFTWARE FOR TRACING THE

SUN ARE AVAILABLE AS OPEN SOURCE CODE, SOURCES THAT IS LISTED IN THIS BOOK. THE BOOK ALSO DESCRIBES THE USE OF SATELLITE TRACKING SOFTWARE AND MECHANISMS IN SOLAR TRACKING APPLICATIONS. IRONICALLY THERE WAS EVEN A SYSTEM CALLED SUN CHASER, SAID TO HAVE BEEN A SOLAR POSITIONER SYSTEM KNOWN FOR CHASING THE SUN THROUGHOUT THE DAY. USING SOLAR EQUATIONS IN AN ELECTRONIC CIRCUIT FOR AUTOMATIC SOLAR TRACKING IS QUITE SIMPLE, EVEN IF YOU ARE A NOVICE, BUT MATHEMATICAL SOLAR EQUATIONS ARE OVER COMPLICATED BY ACADEMIC EXPERTS AND PROFESSORS IN TEXT-BOOKS, JOURNAL ARTICLES AND INTERNET WEBSITES. IN TERMS OF SOLAR HOBBIES, SCHOLARS, STUDENTS AND HOBBYIST'S LOOKING AT SOLAR TRACKING ELECTRONICS OR PC PROGRAMS FOR SOLAR TRACKING ARE USUALLY OVERCOME BY THE SHEER VOLUME OF SCIENTIFIC MATERIAL AND INTERNET RESOURCES, WHICH LEAVES MANY DEVELOPERS IN FRUSTRATION WHEN SEARCH FOR SIMPLE EXPERIMENTAL SOLAR TRACKING SOURCE-CODE FOR THEIR ON-AXIS SUN-TRACKING SYSTEMS. THIS BOOKLET WILL SIMPLIFY THE SEARCH FOR THE MYSTICAL SUN TRACKING FORMULAS FOR YOUR SUN TRACKER INNOVATION AND HELP YOU DEVELOP YOUR OWN AUTONOMOUS SOLAR TRACKING CONTROLLER. BY DIRECTING THE SOLAR COLLECTOR DIRECTLY INTO THE SUN, A SOLAR HARVESTING MEANS OR DEVICE CAN HARNESS SUNLIGHT OR THERMAL HEAT. THIS IS ACHIEVED WITH THE HELP OF SUN ANGLE FORMULAS, SOLAR ANGLE FORMULAS OR SOLAR TRACKING PROCEDURES FOR THE CALCULATION OF SUN'S POSITION IN THE SKY. AUTOMATIC SUN TRACKING SYSTEM SOFTWARE INCLUDES ALGORITHMS FOR SOLAR ALTITUDE AZIMUTH ANGLE CALCULATIONS REQUIRED IN FOLLOWING THE SUN ACROSS THE SKY. IN USING THE LONGITUDE, LATITUDE GPS COORDINATES OF THE SOLAR TRACKER LOCATION, THESE SUN TRACKING SOFTWARE TOOLS SUPPORTS PRECISION SOLAR TRACKING BY DETERMINING THE SOLAR ALTITUDE-AZIMUTH COORDINATES FOR THE SUN TRAJECTORY IN ALTITUDE-AZIMUTH TRACKING AT THE TRACKER LOCATION, USING CERTAIN SUN ANGLE FORMULAS IN SUN VECTOR CALCULATIONS. INSTEAD OF FOLLOW THE SUN SOFTWARE, A SUN TRACKING SENSOR SUCH AS A SUN SENSOR OR WEBCAM OR VIDEO CAMERA WITH VISION BASED SUN FOLLOWING IMAGE PROCESSING SOFTWARE CAN ALSO BE USED TO DETERMINE THE POSITION OF THE SUN OPTICALLY. SUCH OPTICAL FEEDBACK DEVICES ARE OFTEN USED IN SOLAR PANEL TRACKING SYSTEMS AND DISH TRACKING SYSTEMS. DYNAMIC SUN TRACING IS ALSO USED IN SOLAR SURVEYING, DNI ANALYSER AND SUN SURVEYING SYSTEMS THAT BUILD SOLAR INFOGRAPHICS MAPS WITH SOLAR RADIANCE, IRRADIANCE AND DNI MODELS FOR GIS (GEOGRAPHICAL INFORMATION SYSTEM). IN THIS WAY GEOSPATIAL METHODS ON SOLAR/ENVIRONMENT INTERACTION MAKES USE OF GEOSPATIAL TECHNOLOGIES (GIS, REMOTE SENSING, AND CARTOGRAPHY). CLIMATIC DATA AND WEATHER STATION OR WEATHER CENTER DATA, AS WELL AS QUERIES FROM SKY SERVERS AND SOLAR RESOURCE DATABASE SYSTEMS (I.E. ON

DB2, SYBASE, ORACLE, SQL, MYSQL) MAY ALSO BE ASSOCIATED WITH SOLAR GIS MAPS. IN SUCH SOLAR RESOURCE MODELLING SYSTEMS, A PYRANOMETER OR SOLARIMETER IS NORMALLY USED IN ADDITION TO MEASURE DIRECT AND INDIRECT, SCATTERED, DISPERSED, REFLECTIVE RADIATION FOR A PARTICULAR GEOGRAPHICAL LOCATION. SUNLIGHT ANALYSIS IS IMPORTANT IN FLASH PHOTOGRAPHY WHERE PHOTOGRAPHIC LIGHTING ARE IMPORTANT FOR PHOTOGRAPHERS. GIS SYSTEMS ARE USED BY ARCHITECTS WHO ADD SUN SHADOW APPLETs TO STUDY ARCHITECTURAL SHADING OR SUN SHADOW ANALYSIS, SOLAR FLUX CALCULATIONS, OPTICAL MODELLING OR TO PERFORM WEATHER MODELLING. SUCH SYSTEMS OFTEN EMPLOY A COMPUTER OPERATED TELESCOPE TYPE MECHANISM WITH RAY TRACING PROGRAM SOFTWARE AS A SOLAR NAVIGATOR OR SUN TRACER THAT DETERMINES THE SOLAR POSITION AND INTENSITY. THE PURPOSE OF THIS BOOKLET IS TO ASSIST DEVELOPERS TO TRACK AND TRACE SUITABLE SOURCE-CODE AND SOLAR TRACKING ALGORITHMS FOR THEIR APPLICATION, WHETHER A HOBBYIST, SCIENTIST, TECHNICIAN OR ENGINEER. MANY OPEN-SOURCE SUN FOLLOWING AND TRACKING ALGORITHMS AND SOURCE-CODE FOR SOLAR TRACKING PROGRAMS AND MODULES ARE FREELY AVAILABLE TO DOWNLOAD ON THE INTERNET TODAY. CERTAIN PROPRIETARY SOLAR TRACKER KITS AND SOLAR TRACKING CONTROLLERS INCLUDE A SOFTWARE DEVELOPMENT KIT SDK FOR ITS APPLICATION PROGRAMMING INTERFACE API ATTRIBUTES (PEBBLE). WIDGET LIBRARIES, WIDGET TOOLKITS, GUI TOOLKIT AND UX LIBRARIES WITH GRAPHICAL CONTROL ELEMENTS ARE ALSO AVAILABLE TO CONSTRUCT THE GRAPHICAL USER INTERFACE (GUI) FOR YOUR SOLAR TRACKING OR SOLAR POWER MONITORING PROGRAM. THE SOLAR LIBRARY USED BY SOLAR POSITION CALCULATORS, SOLAR SIMULATION SOFTWARE AND SOLAR CONTOUR CALCULATORS INCLUDE MACHINE PROGRAM CODE FOR THE SOLAR HARDWARE CONTROLLER WHICH ARE SOFTWARE PROGRAMMED INTO MICRO-CONTROLLERS, PROGRAMMABLE LOGIC CONTROLLERS PLC, PROGRAMMABLE GATE ARRAYS, ARDUINO PROCESSOR OR PIC PROCESSOR. PC BASED SOLAR TRACKING IS ALSO HIGH IN DEMAND USING C++, VISUAL BASIC VB, AS WELL AS MS WINDOWS, LINUX AND APPLE MAC BASED OPERATING SYSTEMS FOR SUN PATH TABLES ON MATLAB, EXCEL. SOME BOOKS AND INTERNET WEBPAGES USE OTHER TERMS, SUCH AS: SUN ANGLE CALCULATOR, SUN POSITION CALCULATOR OR SOLAR ANGLE CALCULATOR. AS SAID, SUCH SOFTWARE CODE CALCULATE THE SOLAR AZIMUTH ANGLE, SOLAR ALTITUDE ANGLE, SOLAR ELEVATION ANGLE OR THE SOLAR ZENITH ANGLE (ZENITH SOLAR ANGLE IS SIMPLY REFERENCED FROM VERTICAL PLANE, THE MIRROR OF THE ELEVATION ANGLE MEASURED FROM THE HORIZONTAL OR GROUND PLANE LEVEL). SIMILAR SOFTWARE CODE IS ALSO USED IN SOLAR CALCULATOR APPS OR THE SOLAR POWER CALCULATOR APPS FOR IOS AND ANDROID SMARTPHONE DEVICES. MOST OF THESE SMARTPHONE SOLAR MOBILE APPS SHOW THE SUN PATH AND SUN-ANGLES FOR ANY LOCATION AND DATE OVER A 24 HOUR

PERIOD. SOME SMARTPHONES INCLUDE AUGMENTED REALITY FEATURES IN WHICH YOU CAN PHYSICALLY SEE AND LOOK AT THE SOLAR PATH THROUGH YOUR CELL PHONE CAMERA OR MOBILE PHONE CAMERA AT YOUR PHONE'S SPECIFIC GPS LOCATION. IN THE COMPUTER PROGRAMMING AND DIGITAL SIGNAL PROCESSING (DSP) ENVIRONMENT, (FREE/OPEN SOURCE) PROGRAM CODE ARE AVAILABLE FOR VB, .NET, DELPHI, PYTHON, C, C+, C++, PHP, SWIFT, ADM, F, FLASH, BASIC, QBASIC, GBASIC, KBASIC, SIMPL LANGUAGE, SQUIRREL, SOLARIS, ASSEMBLY LANGUAGE ON OPERATING SYSTEMS SUCH AS MS WINDOWS, APPLE MAC, DOS OR LINUX OS. SOFTWARE ALGORITHMS PREDICTING POSITION OF THE SUN IN THE SKY ARE COMMONLY AVAILABLE AS GRAPHICAL PROGRAMMING PLATFORMS SUCH AS MATLAB (MATHWORKS), SIMULINK MODELS, JAVA APPLETS, TRNSYS SIMULATIONS, SCADA SYSTEM APPS, LABVIEW MODULE, BECKHOFF TWINCAT (VISUAL STUDIO), SIEMENS SPA, MOBILE AND IPHONE APPS, ANDROID OR IOS TABLET APPS, AND SO FORTH. AT THE SAME TIME, PLC SOFTWARE CODE FOR A RANGE OF SUN TRACKING AUTOMATION TECHNOLOGY CAN FOLLOW THE PROFILE OF SUN IN SKY FOR SIEMENS, HP, PANASONIC, ABB, ALLAN BRADLEY, OMRON, SEW, FESTO, BECKHOFF, ROCKWELL, SCHNEIDER, ENDRESS HAUSER, FUJII ELECTRIC. HONEYWELL, FUCHS, YOKONAWA, OR MUTHIBISHI PLATFORMS. SUN PATH PROJECTION SOFTWARE ARE ALSO AVAILABLE FOR A RANGE OF MODULAR IPC EMBEDDED PC MOTHERBOARDS, INDUSTRIAL PC, PLC (PROGRAMMABLE LOGIC CONTROLLER) AND PAC (PROGRAMMABLE AUTOMATION CONTROLLER) SUCH AS THE SIEMENS S7-1200 OR SIEMENS LOGO, BECKHOFF IPC OR CX SERIES, OMRON PLC, ERCAM PLC, AC500PLC ABB, NATIONAL INSTRUMENTS NI PXI OR NI cRIO, PIC PROCESSOR, INTEL 8051/8085, IBM (CELL, POWER, BRAIN OR TRUENORTH SERIES), FPGA (XILINX ALTERA NIOS), INTEL, XEON, ATMEL MEGA AVR, MPU, MAPLE, TEENSY, MSP, XMOS, XBEE, ARM, RASPBERRY PI, EAGLE, ARDUINO OR ARDUINO ATMEGA MICROCONTROLLER, WITH SERVO MOTOR, STEPPER MOTOR, DIRECT CURRENT DC PULSE WIDTH MODULATION PWM (CURRENT DRIVER) OR ALTERNATING CURRENT AC SPS OR IPC VARIABLE FREQUENCY DRIVES VFD MOTOR DRIVES (ALSO TERMED ADJUSTABLE-FREQUENCY DRIVE, VARIABLE-SPEED DRIVE, AC DRIVE, MICRO DRIVE OR INVERTER DRIVE) FOR ELECTRICAL, MECHATRONIC, PNEUMATIC, OR HYDRAULIC SOLAR TRACKING ACTUATORS. THE ABOVE MOTION CONTROL AND ROBOT CONTROL SYSTEMS INCLUDE ANALOGUE OR DIGITAL INTERFACING PORTS ON THE PROCESSORS TO ALLOW FOR TRACKER ANGLE ORIENTATION FEEDBACK CONTROL THROUGH ONE OR A COMBINATION OF ANGLE SENSOR OR ANGLE ENCODER, SHAFT ENCODER, PRECISION ENCODER, OPTICAL ENCODER, MAGNETIC ENCODER, DIRECTION ENCODER, ROTATIONAL ENCODER, CHIP ENCODER, TILT SENSOR, INCLINATION SENSOR, OR PITCH SENSOR. NOTE THAT THE TRACKER'S ELEVATION OR ZENITH AXIS ANGLE MAY MEASURED USING AN ALTITUDE ANGLE-, DECLINATION ANGLE-, INCLINATION ANGLE-, PITCH ANGLE-, OR VERTICAL

ANGLE-, ZENITH ANGLE- SENSOR OR INCLINOMETER. SIMILARLY THE TRACKER'S AZIMUTH AXIS ANGLE BE MEASURED WITH A AZIMUTH ANGLE-, HORIZONTAL ANGLE-, OR ROLL ANGLE- SENSOR. CHIP INTEGRATED ACCELEROMETER MAGNETOMETER GYROSCOPE TYPE ANGLE SENSORS CAN ALSO BE USED TO CALCULATE DISPLACEMENT. OTHER OPTIONS INCLUDE THE USE OF THERMAL IMAGING SYSTEMS SUCH AS A FLUKE THERMAL IMAGER, OR ROBOTIC OR VISION BASED SOLAR TRACKER SYSTEMS THAT EMPLOY FACE TRACKING, HEAD TRACKING, HAND TRACKING, EYE TRACKING AND CAR TRACKING PRINCIPLES IN SOLAR TRACKING. WITH UNATTENDED DECENTRALISED RURAL, ISLAND, ISOLATED, OR AUTONOMOUS OFF-GRID POWER INSTALLATIONS, REMOTE CONTROL, MONITORING, DATA ACQUISITION, DIGITAL DATALOGGING AND ONLINE MEASUREMENT AND VERIFICATION EQUIPMENT BECOMES CRUCIAL. IT ASSISTS THE OPERATOR WITH SUPERVISORY CONTROL TO MONITOR THE EFFICIENCY OF REMOTE RENEWABLE ENERGY RESOURCES AND SYSTEMS AND PROVIDE VALUABLE WEB-BASED FEEDBACK IN TERMS OF CO<sub>2</sub> AND CLEAN DEVELOPMENT MECHANISM (CDM) REPORTING. A POWER QUALITY ANALYSER FOR DIAGNOSTICS THROUGH INTERNET, WIFI AND CELLULAR MOBILE LINKS IS MOST VALUABLE IN FRONTLINE TROUBLESHOOTING AND PREDICTIVE MAINTENANCE, WHERE QUICK DIAGNOSTIC ANALYSIS IS REQUIRED TO DETECT AND PREVENT POWER QUALITY ISSUES. SOLAR TRACKER APPLICATIONS COVER A WIDE SPECTRUM OF SOLAR APPLICATIONS AND SOLAR ASSISTED APPLICATION, INCLUDING CONCENTRATED SOLAR POWER GENERATION, SOLAR DESALINATION, SOLAR WATER PURIFICATION, SOLAR STEAM GENERATION, SOLAR ELECTRICITY GENERATION, SOLAR INDUSTRIAL PROCESS HEAT, SOLAR THERMAL HEAT STORAGE, SOLAR FOOD DRYERS, SOLAR WATER PUMPING, HYDROGEN PRODUCTION FROM METHANE OR PRODUCING HYDROGEN AND OXYGEN FROM WATER (HHO) THROUGH ELECTROLYSIS. MANY PATENTED OR NON-PATENTED SOLAR APPARATUS INCLUDE TRACKING IN SOLAR APPARATUS FOR SOLAR ELECTRIC GENERATOR, SOLAR DESALINATOR, SOLAR STEAM ENGINE, SOLAR ICE MAKER, SOLAR WATER PURIFIER, SOLAR COOLING, SOLAR REFRIGERATION, USB SOLAR CHARGER, SOLAR PHONE CHARGING, PORTABLE SOLAR CHARGING TRACKER, SOLAR COFFEE BREWING, SOLAR COOKING OR SOLAR DYING MEANS. YOUR PROJECT MAY BE THE NEXT BREAKTHROUGH OR PATENT, BUT YOUR INVENTION IS HELD BACK BY FRUSTRATION IN SEARCH FOR THE SUN TRACKER YOU REQUIRE FOR YOUR SOLAR POWERED APPLIANCE, SOLAR GENERATOR, SOLAR TRACKER ROBOT, SOLAR FREEZER, SOLAR COOKER, SOLAR DRIER, SOLAR PUMP, SOLAR FREEZER, OR SOLAR DRYER PROJECT. WHETHER YOUR SOLAR ELECTRONIC CIRCUIT DIAGRAM INCLUDE A SIMPLIFIED SOLAR CONTROLLER DESIGN IN A SOLAR ELECTRICITY PROJECT, SOLAR POWER KIT, SOLAR HOBBY KIT, SOLAR STEAM GENERATOR, SOLAR HOT WATER SYSTEM, SOLAR ICE MAKER, SOLAR DESALINATOR, HOBBYIST SOLAR PANELS, HOBBY ROBOT, OR IF YOU ARE DEVELOPING PROFESSIONAL OR HOBBY ELECTRONICS FOR A SOLAR UTILITY OR MICRO SCALE

SOLAR POWERPLANT FOR YOUR OWN SOLAR FARM OR SOLAR FARMING, THIS PUBLICATION MAY HELP ACCELERATE THE DEVELOPMENT OF YOUR SOLAR TRACKING INNOVATION. LATELY, SOLAR POLYGENERATION, SOLAR TRIGENERATION (SOLAR TRIPLE GENERATION), AND SOLAR QUAD GENERATION (ADDING DELIVERY OF STEAM, LIQUID/GASEOUS FUEL, OR CAPTURE FOOD-GRADE CO<sub>2</sub>) SYSTEMS HAVE NEED FOR AUTOMATIC SOLAR TRACKING. THESE SYSTEMS ARE KNOWN FOR SIGNIFICANT EFFICIENCY INCREASES IN ENERGY YIELD AS A RESULT OF THE INTEGRATION AND RE-USE OF WASTE OR RESIDUAL HEAT AND ARE SUITABLE FOR COMPACT PACKAGED MICRO SOLAR POWERPLANTS THAT COULD BE MANUFACTURED AND TRANSPORTED IN KIT-FORM AND OPERATE ON A PLUG-AND PLAY BASIS. TYPICAL HYBRID SOLAR POWER SYSTEMS INCLUDE COMPACT OR PACKAGED SOLAR MICRO COMBINED HEAT AND POWER (CHP OR MCHP) OR SOLAR MICRO COMBINED, COOLING, HEATING AND POWER (CCHP, CHPC, MCCHP, OR MCHPC) SYSTEMS USED IN DISTRIBUTED POWER GENERATION. THESE SYSTEMS ARE OFTEN COMBINED IN CONCENTRATED SOLAR CSP AND CPV SMART MICROGRID CONFIGURATIONS FOR OFF-GRID RURAL, ISLAND OR ISOLATED MICROGRID, MINIGRID AND DISTRIBUTED POWER RENEWABLE ENERGY SYSTEMS. SOLAR TRACKING ALGORITHMS ARE ALSO USED IN MODELLING OF TRIGENERATION SYSTEMS USING MATLAB SIMULINK (MODELICA OR TRNSYS) PLATFORM AS WELL AS IN AUTOMATION AND CONTROL OF RENEWABLE ENERGY SYSTEMS THROUGH INTELLIGENT PARSING, MULTI-OBJECTIVE, ADAPTIVE LEARNING CONTROL AND CONTROL OPTIMIZATION STRATEGIES. SOLAR TRACKING ALGORITHMS ALSO FIND APPLICATION IN DEVELOPING SOLAR MODELS FOR COUNTRY OR LOCATION SPECIFIC SOLAR STUDIES, FOR EXAMPLE IN TERMS OF MEASURING OR ANALYSIS OF THE FLUCTUATIONS OF THE SOLAR RADIATION (I.E. DIRECT AND DIFFUSE RADIATION) IN A PARTICULAR AREA. SOLAR DNI, SOLAR IRRADIANCE AND ATMOSPHERIC INFORMATION AND MODELS CAN THUS BE INTEGRATED INTO A SOLAR MAP, SOLAR ATLAS OR GEOGRAPHICAL INFORMATION SYSTEMS (GIS). SUCH MODELS ALLOW'S FOR DEFINING LOCAL PARAMETERS FOR SPECIFIC REGIONS THAT MAY BE VALUABLE IN TERMS OF THE EVALUATION OF DIFFERENT SOLAR IN PHOTOVOLTAIC OF CSP SYSTEMS ON SIMULATION AND SYNTHESIS PLATFORMS SUCH AS MATLAB AND SIMULINK OR IN LINEAR OR MULTI-OBJECTIVE OPTIMIZATION ALGORITHM PLATFORMS SUCH AS COMPOSE, ENERGYPLAN OR DER-CAM. A DUAL-AXIS SOLAR TRACKER AND SINGLE-AXIS SOLAR TRACKER MAY USE A SUN TRACKER PROGRAM OR SUN TRACKER ALGORITHM TO POSITION A SOLAR DISH, SOLAR PANEL ARRAY, HELIOSTAT ARRAY, PV PANEL, SOLAR ANTENNA OR INFRARED SOLAR NANTENNA. A SELF-TRACKING SOLAR CONCENTRATOR PERFORMS AUTOMATIC SOLAR TRACKING BY COMPUTING THE SOLAR VECTOR. SOLAR POSITION ALGORITHMS (TWINCAT, SPA, OR PSA ALGORITHMS) USE AN ASTRONOMICAL ALGORITHM TO CALCULATE THE POSITION OF THE SUN. IT USES ASTRONOMICAL SOFTWARE ALGORITHMS AND EQUATIONS FOR SOLAR TRACKING IN THE CALCULATION OF SUN'S POSITION IN THE

SKY FOR EACH LOCATION ON THE EARTH AT ANY TIME OF DAY. LIKE AN OPTICAL SOLAR TELESCOPE, THE SOLAR POSITION ALGORITHM PIN-POINTS THE SOLAR REFLECTOR AT THE SUN AND LOCKS ONTO THE SUN'S POSITION TO TRACK THE SUN ACROSS THE SKY AS THE SUN PROGRESSES THROUGHOUT THE DAY. OPTICAL SENSORS SUCH AS PHOTODIODES, LIGHT-DEPENDANT-RESISTORS (LDR) OR PHOTORESISTORS ARE USED AS OPTICAL ACCURACY FEEDBACK DEVICES. LATELY WE ALSO INCLUDED A SECTION IN THE BOOK (WITH LINKS TO MICROPROCESSOR CODE) ON HOW THE PIXART WII INFRARED CAMERA IN THE WII REMOTE OR WIIMOTE MAY BE USED IN INFRARED SOLAR TRACKING APPLICATIONS. IN ORDER TO HARVEST FREE ENERGY FROM THE SUN, SOME AUTOMATIC SOLAR POSITIONING SYSTEMS USE AN OPTICAL MEANS TO DIRECT THE SOLAR TRACKING DEVICE. THESE SOLAR TRACKING STRATEGIES USE OPTICAL TRACKING TECHNIQUES, SUCH AS A SUN SENSOR MEANS, TO DIRECT SUN RAYS ONTO A SILICON OR CMOS SUBSTRATE TO DETERMINE THE X AND Y COORDINATES OF THE SUN'S POSITION. IN A SOLAR MEMS SUN-SENSOR DEVICE, INCIDENT SUNLIGHT ENTERS THE SUN SENSOR THROUGH A SMALL PIN-HOLE IN A MASK PLATE WHERE LIGHT IS EXPOSED TO A SILICON SUBSTRATE. IN A WEB-CAMERA OR CAMERA IMAGE PROCESSING SUN TRACKING AND SUN FOLLOWING MEANS, OBJECT TRACKING SOFTWARE PERFORMS MULTI OBJECT TRACKING OR MOVING OBJECT TRACKING METHODS. IN AN SOLAR OBJECT TRACKING TECHNIQUE, IMAGE PROCESSING SOFTWARE PERFORMS MATHEMATICAL PROCESSING TO BOX THE OUTLINE OF THE APPARENT SOLAR DISC OR SUN BLOB WITHIN THE CAPTURED IMAGE FRAME, WHILE SUN-LOCALIZATION IS PERFORMED WITH AN EDGE DETECTION ALGORITHM TO DETERMINE THE SOLAR VECTOR COORDINATES. AN AUTOMATED POSITIONING SYSTEM HELP MAXIMIZE THE YIELDS OF SOLAR POWER PLANTS THROUGH SOLAR TRACKING CONTROL TO HARNESS SUN'S ENERGY. IN SUCH RENEWABLE ENERGY SYSTEMS, THE SOLAR PANEL POSITIONING SYSTEM USES A SUN TRACKING TECHNIQUES AND A SOLAR ANGLE CALCULATOR IN POSITIONING PV PANELS IN PHOTOVOLTAIC SYSTEMS AND CONCENTRATED PHOTOVOLTAIC CPV SYSTEMS. AUTOMATIC ON-AXIS SOLAR TRACKING IN A PV SOLAR TRACKING SYSTEM CAN BE DUAL-AXIS SUN TRACKING OR SINGLE-AXIS SUN SOLAR TRACKING. IT IS KNOWN THAT A MOTORIZED POSITIONING SYSTEM IN A PHOTOVOLTAIC PANEL TRACKER INCREASE ENERGY YIELD AND ENSURES INCREASED POWER OUTPUT, EVEN IN A SINGLE AXIS SOLAR TRACKING CONFIGURATION. OTHER APPLICATIONS SUCH AS ROBOTIC SOLAR TRACKER OR ROBOTIC SOLAR TRACKING SYSTEM USES ROBOTICA WITH ARTIFICIAL INTELLIGENCE IN THE CONTROL OPTIMIZATION OF ENERGY YIELD IN SOLAR HARVESTING THROUGH A ROBOTIC TRACKING SYSTEM. AUTOMATIC POSITIONING SYSTEMS IN SOLAR TRACKING DESIGNS ARE ALSO USED IN OTHER FREE ENERGY GENERATORS, SUCH AS CONCENTRATED SOLAR THERMAL POWER CSP AND DISH STIRLING SYSTEMS. THE SUN TRACKING DEVICE IN A SOLAR COLLECTOR IN A SOLAR CONCENTRATOR OR SOLAR COLLECTOR SUCH A PERFORMS ON-AXIS SOLAR



TRACKING, A DUAL AXIS SOLAR TRACKER ASSISTS TO HARNESS ENERGY FROM THE SUN THROUGH AN OPTICAL SOLAR COLLECTOR, WHICH CAN BE A PARABOLIC MIRROR, PARABOLIC REFLECTOR, FRESNEL LENS OR MIRROR ARRAY/MATRIX. A PARABOLIC DISH OR REFLECTOR IS DYNAMICALLY STEERED USING A TRANSMISSION SYSTEM OR SOLAR TRACKING SLEW DRIVE MEAN. IN STEERING THE DISH TO FACE THE SUN, THE POWER DISH ACTUATOR AND ACTUATION MEANS IN A PARABOLIC DISH SYSTEM OPTICALLY FOCUSSES THE SUN'S ENERGY ON THE FOCAL POINT OF A PARABOLIC DISH OR SOLAR CONCENTRATING MEANS. A STIRLING ENGINE, SOLAR HEAT PIPE, THERMOSYPHIN, SOLAR PHASE CHANGE MATERIAL PCM RECEIVER, OR A FIBRE OPTIC SUNLIGHT RECEIVER MEANS IS LOCATED AT THE FOCAL POINT OF THE SOLAR CONCENTRATOR. THE DISH STIRLING ENGINE CONFIGURATION IS REFERRED TO AS A DISH STIRLING SYSTEM OR STIRLING POWER GENERATION SYSTEM. HYBRID SOLAR POWER SYSTEMS (USED IN COMBINATION WITH BIOGAS, BIOFUEL, PETROL, ETHANOL, DIESEL, NATURAL GAS OR PNG) USE A COMBINATION OF POWER SOURCES TO HARNESS AND STORE SOLAR ENERGY IN A STORAGE MEDIUM. ANY MULTITUDE OF ENERGY SOURCES CAN BE COMBINED THROUGH THE USE OF CONTROLLERS AND THE ENERGY STORED IN BATTERIES, PHASE CHANGE MATERIAL, THERMAL HEAT STORAGE, AND IN COGENERATION FORM CONVERTED TO THE REQUIRED POWER USING THERMODYNAMIC CYCLES (ORGANIC RANKIN, BRAYTON CYCLE, MICRO TURBINE, STIRLING) WITH AN INVERTER AND CHARGE CONTROLLER.

📖 **BACKPACKER**, 2009 BACKPACKER BRINGS THE OUTDOORS STRAIGHT TO THE READER'S DOORSTEP, INSPIRING AND ENABLING THEM TO GO MORE PLACES AND ENJOY NATURE MORE OFTEN. THE AUTHORITY ON ACTIVE ADVENTURE, BACKPACKER IS THE WORLD'S FIRST GPS-ENABLED MAGAZINE, AND THE ONLY MAGAZINE WHOSE EDITORS PERSONALLY TEST THE HIKING TRAILS, CAMPING GEAR, AND SURVIVAL TIPS THEY PUBLISH. BACKPACKER'S EDITORS' CHOICE AWARDS, AN INDUSTRY HONOR RECOGNIZING DESIGN, FEATURE AND PRODUCT INNOVATION, HAS BECOME THE GOLD STANDARD AGAINST WHICH ALL OTHER OUTDOOR-INDUSTRY AWARDS ARE MEASURED.

📱 **PHONE AND IPAD APPS FOR ABSOLUTE BEGINNERS, IOS 5 EDITION** RORY LEWIS, 2012-06-08 THE IPHONE IS THE HOTTEST GADGET OF OUR GENERATION, AND MUCH OF ITS SUCCESS HAS BEEN FUELED BY THE APP STORE, APPLE'S ONLINE MARKETPLACE FOR IPHONE APPLICATIONS. OVER 1 BILLION APPS WERE DOWNLOADED DURING THE NINE MONTHS FOLLOWING THE LAUNCH OF THE APP STORE, RANGING FROM THE SIMPLEST GAMES TO THE MOST COMPLEX BUSINESS APPS. EVERYONE HAS AN IDEA FOR THE NEXT BESTSELLING IPHONE APP—PRESUMABLY, THAT'S WHY YOU'RE READING THIS NOW! AND WITH THE POPULARITY OF THE IPAD, THIS DEMAND WILL JUST CONTINUE TO GROW. SO HOW DO YOU BUILD AN APPLICATION FOR THE IPHONE AND IPAD? DON'T YOU NEED TO SPEND YEARS LEARNING COMPLICATED PROGRAMMING LANGUAGES? WHAT ABOUT

OBJECTIVE-C AND COCOA TOUCH? THE ANSWER IS THAT YOU DON'T NEED TO KNOW ANY OF THOSE THINGS! ANYBODY CAN START BUILDING SIMPLE APPS FOR THE IPHONE AND IPAD, AND THIS BOOK WILL SHOW YOU HOW. THIS UPDATE OF AN APRESS BESTSELLER WALKS YOU THROUGH CREATING YOUR FIRST APP, USING PLAIN ENGLISH AND PRACTICAL EXAMPLES USING THE IOS 5 SOFTWARE DEVELOPMENT PLATFORM AND MORE. IT CUTS THROUGH THE FOG OF JARGON AND MISINFORMATION THAT SURROUNDS IPHONE AND IPAD APPLICATION DEVELOPMENT, AND GIVES YOU SIMPLE, STEP-BY-STEP INSTRUCTIONS TO GET YOU STARTED. TEACHES IPHONE AND IPAD APPS DEVELOPMENT IN LANGUAGE ANYONE CAN UNDERSTAND PROVIDES SIMPLE, STEP-BY-STEP EXAMPLES THAT MAKE LEARNING EASY, USING IOS 5 OFFERS VIDEOS THAT ENABLE YOU TO FOLLOW ALONG WITH THE AUTHOR—IT'S LIKE YOUR OWN PRIVATE CLASSROOM

📖 **FIVE-STAR APPS** GLENN FLEISHMAN, 2010-11-02 IT CAN BE A CONCIERGE, CAMERA, FLASHLIGHT, GAME CONSOLE, MAGAZINE, PHOTO EDITOR, PANORAMA MAKER, NOTE TAKER, TRAVEL PLANNER, RADIO, BOOKSTORE, NIGHT-SKY GUIDE, GPS, MUSIC PLAYER, MUSIC MAKER, AND PLENTY MORE...IF ONLY YOU COULD FIGURE OUT WHICH OF THE 250,000 (AND COUNTING) APPS TO PUT ON YOUR IPHONE OR IPAD OR IPOD TOUCH. AUTHOR GLENN FLEISHMAN SET OUT TO DISCOVER HOW TO USE YOUR DEVICE TO FIND A MOVIE, READ A BOOK, RETRIEVE A DISTANT FILE, MAKE A PHONE CALL, PLAY A STRATEGY GAME—TO ACCOMPLISH A HOST OF USEFUL, AND SOMETIMES COMPLETELY UNUSEFUL, TASKS. GLENN SIFTED THROUGH AND ROAD TESTED THOUSANDS OF APPS TO FIND THE NEARLY 200 PROGRAMS THAT FIT HIS CRITERIA FOR INTERESTING, ENTERTAINING, USEFUL—AND ESSENTIAL—FIVE-STAR APPS. HIS CLEAR-EYED SELECTIONS WILL SURPRISE AND CHARM YOU AND HELP YOU COMPLETE TASKS, HAVE FUN, BE CREATIVE, AND LEARN SOMETHING. WANT TO READ A BOOK OR PDF OR FOLLOW YOUR TWITTER, RSS, OR FACEBOOK FEEDS? YOU'LL FIND THE PERFECT APP FOR THE JOB. READY TO FIND THE BEST ACTION, WORD, AND STRATEGY GAMES—SO GOOD, YOU MAY NEVER PUT DOWN YOUR IPHONE? WE KNOW THE ONES. YEARNING FOR THAI FOOD IN AN UNFAMILIAR NEIGHBORHOOD OR LOOKING TO RESERVE A TABLE AT A LOCAL RESTAURANT? THIS BOOK POINTS YOU TO THE PERFECT APPS. NEED TO TRACK THE DELIVERY STATUS OF A PACKAGE OR TURN YOUR DEVICE INTO A BARCODE READER? START READING AND START SCANNING. WANT TO WATCH A MOVIE—EITHER FROM THE STUDIOS OR OF YOUR OWN CREATION? GLENN CAN DIRECT YOU TO THE PERFECT APP. PLUS ESSENTIAL APPS THAT WILL STREAM MUSIC, MAKE YOU MORE PRODUCTIVE, KEEP TRACK OF FILES, AND MUCH, MUCH MORE.


📖 **IPHONE FOR WORK** RYAN FAAS, 2011-02-03 THE IPHONE IS COOL, AND THE IPHONE IS FUN, BUT THE IPHONE ALSO MEANS SERIOUS BUSINESS. FOR THOSE OF YOU WHO BOUGHT YOUR IPHONES TO HELP GET YOUR LIVES ORGANIZED AND FREE YOURSELVES FROM THE BALL AND CHAIN OF DESKTOP COMPUTING, IPHONE AT


WORK: PRODUCTIVITY FOR PROFESSIONALS IS THE BOOK TO SHOW YOU HOW. THERE ARE PLENTY OF GENERAL-PURPOSE IPHONE GUIDES, BUT IPHONE AT WORK: PRODUCTIVITY FOR PROFESSIONALS SHOWS YOU HOW TO COMPLETE ALL THE TRADITIONAL SMARTPHONE TASKS, LIKE TO-DO LISTS, CALENDARS, AND E-MAIL, AND BECOME MUCH MORE EFFICIENT AND PRODUCTIVE AT WORK. YOU'LL LEARN MECHANISMS FOR DEVELOPING EFFECTIVE WORKFLOWS SPECIFIC TO THE FEATURES OF THE IPHONE AND ALSO EFFICIENT STRATEGIES FOR DEALING WITH THE SPECIALIZED ASPECTS OF BUSINESS AND PROFESSIONAL LIFESTYLES. FROM THE INTRODUCTION AND THROUGHOUT THE BOOK, AUTHOR RYAN FAAS TARGETS PROFESSIONAL USERS OF THE IPHONE. YOU'LL TOUR THE BUILT-IN APPLICATIONS AND CONFIGURATION OPTIONS, ALWAYS WITH WORK AND PRODUCTIVITY IN MIND, AND DISCOVER ALL OF THE ENTERPRISE FEATURES OF THE IPHONE, LEARNING HOW TO CONFIGURE AND USE EACH ONE. THEN DISCOVER THE APP STORE: SOURCE OF ALL THIRD-PARTY SOFTWARE. THERE'S SOMETHING A BIT DAUNTING ABOUT THE DOMINANCE OF GAMES AND FRIVOLOUS APPS ON THE BEST-SELLER LISTS, BUT THERE ARE SERIOUS BUSINESS AND VERTICAL APPLICATIONS ALSO AVAILABLE, AND YOU'LL LEARN ABOUT SOME OF THE BEST AND HOW TO TAKE ADVANTAGE OF THIS WEALTH OF ADD-ON AND VERY PROFESSIONAL FUNCTIONALITY. AND FOR THOSE ADMINISTRATORS WITH THE SPECIAL JOB OF DEPLOYING LOTS OF NEW IPHONES ACROSS THE ENTERPRISE, THIS BOOK CONCLUDES WITH TWO APPENDIXES THAT PROVIDE INFORMATION AND RESOURCES FOR COMPANIES. THE FIRST IS INTENDED FOR ORGANIZATIONS LOOKING TO PERFORM LARGER-SCALE IPHONE OR IPOD TOUCH DEPLOYMENTS COMPLETE WITH DEVICE MANAGEMENT. THE SECOND IS GEARED FOR THOSE COMPANIES THAT WISH TO DEVELOP AN IPHONE PLATFORM-ORIENTED INFRASTRUCTURE THROUGH THE USE OF CUSTOMIZED IN-HOUSE APPLICATIONS AND IPHONE/IPOD TOUCH-SPECIFIC WEB SERVICES.

🔗 THE ROUGH GUIDE TO THE IPHONE (5TH) PETER BUCKLEY, 2013-02-01 Now AVAILABLE IN EPUB FORMAT. FULLY UPDATED TO COVER THE IPHONE 5 AND IOS6, THE BESTSELLING ROUGH GUIDE TO THE IPHONE IS THE ULTIMATE GUIDE TO THE DEFINITIVE GADGET OF OUR TIME. THE FULL COLOR GUIDE SHOWS YOU HOW TO MAKE THE MOST OF THE IPHONE 5'S UNIQUE BLEND OF FUN AND FUNCTION. THE BOOK COVERS THE BASICS, SUCH AS SYNCHRONIZING WITH ICLOUD, USING FACETIME, MAKING THE MOST OF SIRI, AND EXPLORING THE LATEST BUILT-IN FEATURES, INCLUDING FACEBOOK INTEGRATION, PANORAMIC PHOTOS, AND APPLE MAPS. THE GUIDE ALSO UNLOCKS NEW SECRETS, SUCH AS HOW TO MAKE FREE INTERNATIONAL CALLS, AND THERE'S EVEN UP-TO-DATE ADVICE ON THE COOLEST APPS AVAILABLE ON THE APP STORE. WHETHER YOUR FOCUS IS PRODUCTIVITY OR CREATIVITY, THE ROUGH GUIDE TO THE IPHONE WILL TURN YOU FROM AN IPHONE USER INTO AN IPHONE GURU.

🔗 IPHONE AND IPAD APPS FOR ABSOLUTE BEGINNERS RORY LEWIS, 2011-01-27

THE IPHONE IS THE HOTTEST GADGET OF OUR GENERATION, AND MUCH OF ITS SUCCESS HAS BEEN FUELED BY THE APP STORE, APPLE'S ONLINE MARKETPLACE FOR IPHONE APPLICATIONS. OVER 1 BILLION APPS HAVE BEEN DOWNLOADED IN THE 9 MONTHS THE APP STORE HAS BEEN OPEN, RANGING FROM THE SIMPLEST GAMES TO THE MOST COMPLEX BUSINESS APPS. EVERYONE HAS AN IDEA FOR THE NEXT BEST-SELLING IPHONE APP—PRESUMABLY THAT'S WHY YOU'RE READING THIS NOW. AND WITH THE RELEASE OF THE IPAD, THIS DEMAND WILL JUST CONTINUE TO GROW. SO HOW DO YOU BUILD AN APPLICATION FOR THE IPHONE AND IPAD? DON'T YOU NEED TO SPEND YEARS LEARNING COMPLICATED PROGRAMMING LANGUAGES? WHAT ABOUT OBJECTIVE-C, COCOA TOUCH, AND THE SOFTWARE DEVELOPMENT KIT (SDK)? THE ANSWER IS THAT YOU DON'T NEED TO KNOW ANY OF THOSE THINGS. ANYBODY CAN START BUILDING SIMPLE APPLICATIONS FOR THE IPHONE AND IPAD, AND THIS BOOK WILL SHOW YOU HOW. THIS BOOK TAKES YOU TO GETTING YOUR FIRST APPLICATIONS UP AND RUNNING USING PLAIN ENGLISH AND PRACTICAL EXAMPLES. IT CUTS THROUGH THE FOG OF JARGON AND MISINFORMATION THAT SURROUNDS IPHONE AND IPAD APPLICATION DEVELOPMENT, AND GIVES YOU SIMPLE, STEP-BY-STEP INSTRUCTIONS TO GET YOU STARTED. TEACHES IPHONE AND IPAD APPLICATION DEVELOPMENT IN LANGUAGE ANYONE CAN UNDERSTAND PROVIDES SIMPLE, STEP-BY-STEP EXAMPLES THAT MAKE LEARNING EASY OFFERS VIDEOS THAT ENABLE YOU TO FOLLOW ALONG WITH THE AUTHOR—IT'S LIKE YOUR OWN PRIVATE CLASSROOM

 **IPHONE FOR DUMMIES** EDWARD C. BAIG, GUY HART-DAVIS, 2022-10-18 Hey Siri, ORDER IPHONE FOR DUMMIES IPHONE FOR DUMMIES, THE MUCH-LOVED GUIDE TO APPLE'S KILLER SMARTPHONE, IS UPDATED FOR 2023. THIS BOOK WALKS YOU THROUGH ALL THE LATEST FEATURES OF IOS 16 AND THE LATEST IPHONE MODELS, INCLUDING THE IPHONE 14. LOOKING FOR A GUIDE TO AN OLDER MODEL? WE'VE GOT YOU COVERED THERE, TOO, WITH PLENTY OF KNOW-HOW THAT APPLIES TO PREVIOUS IPHONES. KEEP IN TOUCH WITH FAMILY AND FRIENDS ALL OVER THE WORLD WITH CALLS, TEXTS, AND FACETIME. WE'LL ALSO SHOW YOU HOW TO USE YOUR IPHONE AS A MUSIC PLAYER, A GAMING SYSTEM, A CAMERA, AND A PRODUCTIVITY ENHANCER, ALL WRAPPED UP IN ONE TOUCH-SCREEN PACKAGE. LEARN YOUR WAY AROUND YOUR APPLE IPHONE 14 (OR OLDER MODELS) DISCOVER THE NEW FEATURES OF IOS 16 AND MAKE THE MOST OF YOUR PHONE CUSTOMIZE YOUR SETTINGS, KEEP YOUR PHONE SECURE, AND MASTER THE APPS TAKE PICTURES, COMMUNICATE WITH FACETIME, PLAY GAMES, AND BEYOND IPHONE FOR DUMMIES OFFERS EXPERT INSIGHT ON HOW TO MAKE THE MOST OF YOUR IPHONE AND ITS UPDATED FEATURES. PEEK INSIDE FOR THE LATEST IOS 16 FEATURES, AS WELL AS THE UPDATED HARDWARE FEATURES ON THE LATEST IPHONE MODELS.

 **LIBRARY AS SAFE HAVEN** DEBORAH D. HALSTED, SHARI C. CLIFTON, DANIEL T. WILSON, 2014 LIBRARIES HAVE ALWAYS PLAYED A SPECIAL ROLE IN TIMES OF

DISASTER BY CONTINUING TO PROVIDE CRUCIAL INFORMATION AND SERVICES. THE STAFFORD ACT OF 2011, A FEDERAL GOVERNMENT DIRECTIVE, DESIGNATES LIBRARIES AS AMONG THE TEMPORARY FACILITIES DELIVERING ESSENTIAL SERVICES, MAKING A CONTINUITY OF OPERATIONS PLAN IMPERATIVE FOR LIBRARIES. PEPPERED WITH INFORMATIVE FIRST-PERSON NARRATIVES FROM LIBRARIANS RECOUNTING EMERGENCY SITUATIONS, HALSTED, CLIFTON, AND WILSON COVER SUCH TOPICS AS: AN EIGHT-STEP APPROACH TO DEVELOPING A RISK ASSESSMENT PLANHOW TO DRAFT A ONE-PAGE SERVICE CONTINUITY PLANINFORMATION ON HOW TO USE MOBILE DEVICES AND SOCIAL MEDIA EFFECTIVELY IN TIMES OF DISASTERSAMPLE DISASTER PLANS, ALONG WITH MODEL EXERCISES, MANUALS AND CUSTOMIZABLE COMMUNICATIONSPUBLISHED IN COOPERATION WITH THE MEDICAL LIBRARY ASSOCIATION (MLA), THIS NUTS-AND-BOLTS RESOURCE WILL ENABLE LIBRARIES OF ALL KINDS TO DO THEIR BEST WHILE PLANNING FOR THE WORST.

🔍 **GENEALOGY ONLINE FOR DUMMIES** APRIL LEIGH HELM,MATTHEW L. HELM,2014-02-03 OFFERS ADVICE ON RESEARCHING FAMILY HISTORY ON THE WEB, INCLUDING SEARCH STRATEGIES, DATA SHARING, GOVERNMENT RECORDS, GENEALOGICAL SOFTWARE, AND PUBLISHING THE RESULTS ON THE INTERNET.

🔍 **BILLBOARD**,2011-07-02 IN ITS 114TH YEAR, BILLBOARD REMAINS THE WORLD'S PREMIER WEEKLY MUSIC PUBLICATION AND A DIVERSE DIGITAL, EVENTS, BRAND, CONTENT AND DATA LICENSING PLATFORM. BILLBOARD PUBLISHES THE MOST TRUSTED CHARTS AND OFFERS UNRIVALED REPORTING ABOUT THE LATEST MUSIC, VIDEO, GAMING, MEDIA, DIGITAL AND MOBILE ENTERTAINMENT ISSUES AND TRENDS.

🔍 **THE JOY OF GEOCACHING** PAUL GILLIN,DANA GILLIN,2010-04-01 DESCRIBING THE EXCITING AND ADVENTUROUS WORLD SURROUNDING GEOCACHING--A WORLDWIDE HUNT IN WHICH TREASURES ARE LOCATED USING GLOBAL POSITIONING SYSTEM (GPS) DEVICES--THIS BOOK OFFERS AN UNDERSTANDING AND APPLICATION OF THE PRINCIPLES AND BEST PRACTICES OF THE GAME. WHAT'S DIFFERENT IS THAT THE AUTHORS WRAP THIS KNOWLEDGE IN A TAPESTRY OF HUMAN STORIES THAT RANGE FROM HILARIOUS TO TOUCHING. PAUL AND DANA GILLIN INTERVIEWED 40 OF THE WORLD'S 50 MOST PROLIFIC GEOCACHERS AS WELL AS EXPERTS IN CONTAINER DESIGN, EXTREME GEOCACHING AND OTHER DIMENSIONS OF THE GAME. THEY TELL HOW THIS GLOBAL ACTIVITY INSPIRES PASSION THAT HAS HELPED PEOPLE HEAL FRAYED MARRIAGES, ESTABLISH NEW FRIENDSHIPS--AND EVEN SAVE LIVES.

🔍 **GENEALOGY FOR DUMMIES** MATTHEW L. HELM,APRIL LEIGH HELM,2017-06-20 THE FUN WAY TO RESEARCH YOUR FAMILY HISTORY GENEALOGY FOR DUMMIES, 8TH EDITION COVERS EVERYTHING YOU NEED TO KNOW ABOUT STARTING A GENEALOGICAL RESEARCH PROJECT--INCLUDING WHERE AND HOW TO FIND INFORMATION, HOW TO COMMUNICATE WITH OTHER ONLINE GENEALOGISTS, HOW TO LEVERAGE SOCIAL NETWORKING SITES AND APPS, HOW TO ADD DIGITAL IMAGES TO YOUR FAMILY TREE, AND HOW TO BUILD YOUR OWN SITE


FOR SHARING INFORMATION. IT ALSO EXPLAINS THE USE OF COMPILED GENEALOGIES, U.S. CENSUS INFORMATION, AND PUBLIC ACCESS CATALOGS. BRAND NEW TO THIS EDITION IS CONTENT ON HOW TO CONDUCT GENEALOGICAL RESEARCH ON THE ROAD, AND ON HOW TO TAKE THIS RESEARCH AND INTEGRATE IT INTO THE DATA FOUND AT HOME. IT ALSO CONTAINS NEW INFORMATION ON DNA RESEARCH AND TESTING, NEW GEOCODING APPLICATIONS TO RECORD GEOGRAPHIC DATA INTO A GENEALOGICAL DATABASE, AND OTHER NEW TECHNOLOGIES. THE BOOK COVERS WHICH APPS ARE WORTH YOUR MONEY, AND HOW TO GET THE MOST OUT OF THEM. USE THE LATEST TOOLS TO RESEARCH FAMILY HISTORY CREATE YOUR OWN SITE TO SHOWCASE YOUR FAMILY TREE, DIGITAL IMAGES, AND COMPILED GENEALOGIES GET ACCESS TO FREE VERSIONS OF LEGACY FAMILY TREE AND PERSONAL ANCESTRAL FILES UTILIZE BOTH ONLINE AND OFFLINE RESEARCH TECHNIQUES AND TOOLS FOLLOW THE CLUES TO UNCOVER YOUR FAMILY'S LEGACY—AND HAVE FUN ALONG THE WAY!


📖 *TAKE CONTROL OF iOS & iPadOS PRIVACY AND SECURITY, 4TH EDITION*  
GLENN FLEISHMAN, 2023-12-13 MASTER NETWORKING, PRIVACY, AND SECURITY FOR iOS AND iPadOS! VERSION 4.2, UPDATED JANUARY 29, 2024 ENSURING THAT YOUR iPhone OR iPad'S DATA REMAINS SECURE AND IN YOUR CONTROL AND THAT YOUR PRIVATE DATA REMAINS PRIVATE ISN'T A BATTLE—IF YOU KNOW WHAT BOXES TO CHECK AND HOW TO CONFIGURE iOS AND iPadOS TO YOUR ADVANTAGE. TAKE CONTROL OF iOS & iPadOS PRIVACY AND SECURITY TAKES YOU INTO THE INTRICACIES OF APPLE'S CHOICES WHEN IT COMES TO NETWORKING, DATA SHARING, AND ENCRYPTION—AND PROTECTING YOUR PERSONAL SAFETY. SUBSTANTIALLY UPDATED TO COVER DOZENS OF CHANGES AND NEW FEATURES IN iOS 17 AND iPadOS 17! YOUR iPhone AND iPad HAVE BECOME THE CENTER OF YOUR DIGITAL IDENTITY, AND IT'S EASY TO LOSE TRACK OF ALL THE WAYS IN WHICH APPLE AND OTHER PARTIES ACCESS YOUR DATA LEGITIMATELY—OR WITHOUT YOUR FULL KNOWLEDGE AND CONSENT. WHILE APPLE NEARLY ALWAYS ERRS ON THE SIDE OF DISCLOSURE AND PERMISSION, MANY OTHER FIRMS DON'T. THIS BOOK COMPREHENSIVELY EXPLAINS HOW TO CONFIGURE iOS 17, iPadOS 17, AND iCloud-BASED SERVICES TO BEST PROTECT YOUR PRIVACY WITH MESSAGING, EMAIL, BROWSING, AND MUCH MORE. THE BOOK ALSO SHOWS YOU HOW TO ENSURE YOUR DEVICES AND DATA ARE SECURE FROM INTRUSION FROM ATTACKERS OF ALL TYPES. YOU'LL GET PRACTICAL STRATEGIES AND CONFIGURATION ADVICE TO PROTECT YOURSELF AGAINST PSYCHOLOGICAL AND PHYSICAL THREATS, INCLUDING RESTRICTIONS ON YOUR FREEDOM AND SAFETY. FOR INSTANCE, YOU CAN NOW SCREEN IMAGES THAT MAY CONTAIN NUDE IMAGES, WHILE APPLE HAS FURTHER ENHANCED LOCKDOWN MODE TO BLOCK POTENTIAL ATTACKS BY GOVERNMENTS, INCLUDING YOUR OWN. TAKE CONTROL OF iOS & iPadOS PRIVACY AND SECURITY COVERS HOW TO CONFIGURE THE HUNDREDS OF PRIVACY AND DATA SHARING SETTINGS APPLE OFFERS IN iOS AND iPadOS, AND WHICH IT MEDIATES

FOR THIRD-PARTY APPS. SAFARI NOW HAS UMPTEEN DIFFERENT STRATEGIES BUILT IN BY APPLE TO PROTECT YOUR WEB SURFING HABITS, PERSONAL DATA, AND IDENTITY, AND NEW FEATURES IN SAFARI, MAIL, AND MESSAGES THAT BLOCK TRACKING OF YOUR MOVEMENT ACROSS SITES, ACTIONS ON ADS, AND EVEN WHEN YOU OPEN AND VIEW AN EMAIL MESSAGE. IN ADDITION TO PRIVACY AND SECURITY, THIS BOOK ALSO TEACHES YOU EVERYTHING YOU NEED TO KNOW ABOUT NETWORKING, WHETHER YOU'RE USING 3G, 4G LTE, OR 5G CELLULAR, WI-FI OR BLUETOOTH, OR COMBINATIONS OF ALL OF THEM; AS WELL AS ABOUT AIRDROP, AIRPLAY, AIRPLANE MODE, PERSONAL HOTSPOT, AND TETHERING. YOU'LL LEARN HOW TO:

- TWIDDLE 5G SETTINGS TO ENSURE THE BEST NETWORK SPEEDS ON YOUR IPHONE OR IPAD.
- MASTER THE OPTIONS FOR A PERSONAL HOTSPOT FOR YOURSELF AND IN A FAMILY SHARING GROUP.
- SET UP A DEVICE SECURELY FROM THE MOMENT YOU POWER UP A NEW OR NEWLY RESTORED IPHONE OR IPAD.
- MANAGE APPLE'S BUILT-IN SECOND FACTOR VERIFICATION CODE GENERATOR FOR EXTRA-SECURE WEBSITE AND APP LOGINS.
- CREATE GROUPS OF PASSWORDS AND PASSKEYS YOU CAN SHARE SECURELY WITH OTHER IPHONE, IPAD, AND MAC USERS.
- DECIDE WHETHER ADVANCED DATA PROTECTION IN ICLOUD, AN ENHANCED ENCRYPTION OPTION THAT MAKES NEARLY ALL YOUR ICLOUD DATA IMPOSSIBLE FOR EVEN APPLE TO VIEW, MAKES SENSE FOR YOU.
- USE PASSKEYS, A HIGH-SECURITY BUT EASY-TO-USE WEBSITE LOGIN SYSTEM WITH INDUSTRY-WIDE SUPPORT.
- BLOCK UNKNOWN (AND UNWANTED) CALLERS, IMESSAGE SENDERS, AND PHONE CALLS, NOW INCLUDING FACETIME.
- PROTECT YOUR EMAIL BY USING HIDE MY EMAIL, A ICLOUD+ TOOL TO GENERATE AN ADDRESS APPLE MANAGES AND RELAYS MESSAGES THROUGH FOR YOU—NOW INCLUDING EMAIL USED WITH APPLE PAY TRANSACTIONS.
- USE SAFARI'S BLOCKING TECHNIQUES AND HOW TO REVIEW WEBSITES' ATTEMPTS TO TRACK YOU, INCLUDING THE LATEST IMPROVEMENTS IN IOS 17 AND IPADOS 17.
- USE COMMUNICATION SAFETY, A WAY TO ALERT YOUR CHILDREN ABOUT SENSITIVE IMAGES—BUT NOW ALSO A TOOL TO KEEP UNSOLICITED AND UNWANTED IMAGES OF PRIVATE PARTS FROM APPEARING ON YOUR DEVICES.
- UNDERSTAND WHY APPLE MIGHT ASK FOR YOUR IPHONE, IPAD, OR MAC PASSWORD WHEN YOU LOG IN ON A NEW DEVICE USING TWO-FACTOR AUTHENTICATION.
- KEEP YOURSELF SAFE WHEN EN ROUTE TO A DESTINATION BY CREATING A CHECK IN PARTNER WHO WILL BE ALERTED IF YOU DON'T REACH YOUR INTENDED END POINT OR DON'T RESPOND WITHIN A PERIOD OF TIME.
- DIG INTO PRIVATE BROWSING'S SEVERAL NEW FEATURES IN IOS 17/IPADOS 17, DESIGNED TO LET YOU LEAVE NO TRACE OF YOUR IDENTITY OR ACTIONS BEHIND, WHILE PROTECTING YOUR IPHONE OR IPAD FROM PRYING EYES, TOO.
- MANAGE DATA USAGE ACROSS TWO PHONE SIMS (OR ESIMS) AT HOME AND WHILE TRAVELING.
- USE A HARDWARE ENCRYPTION KEY TO STRONGLY PROTECT YOUR APPLE ID ACCOUNT.
- SHARE A WI-FI PASSWORD WITH NEARBY CONTACTS AND VIA A QR

CODE. • DIFFERENTIATE BETWEEN ENCRYPTED DATA SESSIONS AND END-TO-END ENCRYPTION. • STREAM MUSIC AND VIDEO TO OTHER DEVICES WITH AIRPLAY 2. • USE iCloud+'s PRIVATE RELAY, A PRIVACY-PROTECTING BROWSING SERVICE THAT KEEPS YOUR HABITS AND LOCATIONS FROM PRYING MARKETING EYES. • DETER BRUTE-FORCE CRACKING BY RELYING ON AN ACCESSORIES TIMEOUT FOR DEVICES PHYSICALLY BEING PLUGGED IN THAT USE USB AND OTHER STANDARDS. • CONFIGURE BLUETOOTH DEVICES. • ENJOY ENHANCED AIRDROP OPTIONS THAT LET YOU TAP TWO IPHONES TO TRANSFER FILES AND CONTINUE FILE TRANSFERS OVER THE INTERNET WHEN YOU MOVE OUT OF RANGE. • PROTECT APPLE ID ACCOUNT AND iCloud DATA FROM UNWANTED ACCESS AT A REGULAR LEVEL AND VIA THE NEW SAFETY CHECK, DESIGNED TO LET YOU REVIEW OR SEVER DIGITAL CONNECTIONS WITH PEOPLE YOU KNOW WHO MAY WISH YOU HARM.

 **GEOLOCATION IN IOS** ALASDAIR ALLAN, 2012 THE IPHONE AND IPAD ALLOW USER POSITIONING VIA MULTIPLE METHODS, INCLUDING GPS. THE GROWING NUMBER LOCATION-AWARE, AND LOCATION-FENCED, APPLICATIONS NOW ARRIVING IN THE APP STORE MAKE HEAVY USE OF THESE ABILITIES. THIS BOOK WALKS YOU THROUGH THE BASIC TOOLS YOU NEED TO BUILD GEO-AWARE APPLICATIONS BEFORE DIVING INTO THE AVAILABLE THIRD-PARTY GEO-SDKS AVAILABLE FOR THE IOS PLATFORM.

 **MOBILE TRACKING** MICHAEL M, 2014-12-09 THERE ARE MOBILE PHONES APPLICATIONS THAT CAN BE ACQUIRED WHICH WILL HELP YOU FIND YOUR SMART PHONE THROUGH THE TRIANGULATION TRANSFORMS INSIDE A COUPLE OF METERS OF ITS REAL AREA. MOBILE TRACKING PROVIDES YOU THE ABILITY TO TRACK YOUR SMART PHONE'S AREA UTILIZING AN IP, WI-FI, GPS, OR GSM SYSTEM ASSOCIATION AROUND THE WORLD. ALL ASSOCIATIONS MADE TO THESE SYSTEMS, EVEN ONES UTILIZING CELLS AS MODEMS, CAN BE RECORDED ALONGSIDE EXCELLENT WEB PROGRAM INFORMATION. WHAT YOU'LL GET INSIDE: - HOW DOES THE SYSTEM WORK? - MOBILE TRACKING SYSTEMS - MOBILE TRACKING GPS SYSTEMS - MOBILE TRACKING IMEI SYSTEMS - HOW THIS SYSTEM WORKS? - TOP 10 WAY TO TRACK YOUR PHONE USING IMEI - IMEI - AVAST! MOBILE SECURITY - MOBILE CHASE-LOCATION TRACKER - THIEF TRACKER - SMART LOOK - USE ANTI THIEF ALARM - KASPERSKY MOBILE SECURITY - LOOKOUT SECURITY AND ANTIVIRUS - TREND MICRO MOBILE SECURITY & ANTIVIRUS - PLAN B, LOOKOUT SMARTPHONE SECURITY - MOBILE TRACKING GSM SYSTEM - PROFONE GSM TRACKER - MOBILE TRACKING SOFTWARE - MOBIWEE - SOS TRACKER - GLYPSE - MOBILE DEFENSE - HIGHSTERMOBILE - ILOCALIS - MOBILE TRACKING SYSTEM - INSTAMAPPER - FLEXISPY - GPSED - WHERE'S MY DROID - ANDROID LOST FREE - CERBERUS - PREY - GOOGLE LATTTUDE (IOS, ANDROID & OTHERS) TAKE A SNEAK PEAK INSIDE (PAGE 16): PROFONE GSM TRACKER IT IS THE BEST GSM TRACKER EVER KNOWN. FIND CELL PHONES' AREA ONLINE BY CELL TOWER TRIANGULATION UTILIZING



LAC (LOCATION AREA CODE) AND CELLED FROM PC, IPHONE OR ANDROIDE PHONE. CELL TOWER TRIANGULATION UTILIZES THE LAC AND CELLID TO FOCUS THE POSITION OF A CELLULAR SMARTPHONE. WITH INFORMATION FROM NO LESS THAN THREE CELL TOWERS, THIS STRATEGY CAN ASCERTAIN A HANDSET'S AREA EXACTLY. EACH ONE BASE STATION COVERS A CERTAIN REGION, THE MORE CELL TOWERS IN YOUR GENERAL VICINITY, THE MORE PRECISE RESULT IT DELIVERS. SO THE THICKNESS OF CELL TOWERS DECIDES THE PRECISION. FOR THE MOST PART, THE THICKNESS IS HIGHER IN THE URBAN ZONES PARTICULARLY AT DOWNTOWN. WHILE IN COUNTRY TERRITORIES, WHERE THERE ARE LESS CELL TOWERS, THE RESULT IS LESS PRECISE. BUY NOW & GIVE ME AN OPPORTUNITY TO GROW YOUR KNOWLEDGE!

**SUN TRACKING AND SOLAR RENEWABLE ENERGY HARVESTING** GERRO PRINSLOO, ROBERT DOBSON, 2015-11-02 FREE TO DOWNLOAD eBook ON PRACTICAL SOLAR TRACKING DESIGN, SOLAR TRACKING, SUN TRACKING, SUN TRACKER, SOLAR TRACKER, FOLLOW SUN, SUN POSITION CALCULATION (AZIMUTH, ELEVATION, ZENITH), SUN FOLLOWING, SUNRISE, SUNSET, MOON-PHASE, MOONRISE, MOONSET CALCULATORS. IN HARNESSING POWER FROM THE SUN THROUGH A SOLAR TRACKER OR SOLAR TRACKING SYSTEM, RENEWABLE ENERGY SYSTEM DEVELOPERS REQUIRE AUTOMATIC SOLAR TRACKING SOFTWARE AND SOLAR POSITION ALGORITHMS. ON-AXIS SUN TRACKING SYSTEM SUCH AS THE ALTITUDE-AZIMUTH DUAL AXIS OR MULTI-AXIS SOLAR TRACKER SYSTEMS USE A SUN TRACKING ALGORITHM OR RAY TRACING SENSORS OR SOFTWARE TO ENSURE THE SUN'S PASSAGE THROUGH THE SKY IS TRACED WITH HIGH PRECISION IN AUTOMATED SOLAR TRACKER APPLICATIONS, RIGHT THROUGH SUMMER SOLSTICE, SOLAR EQUINOX AND WINTER SOLSTICE. ECO FRIENDLY AND ENVIRONMENTALLY SUSTAINABLE MICRO COMBINED SOLAR HEAT AND POWER (M-CHP, M-CCHP, M-CHCP) WITH MICROGRID STORAGE AND LAYERED SMARTGRID CONTROL TOWARDS SUPPLYING OFF-GRID RURAL VILLAGES IN DEVELOPING BRICS COUNTRIES SUCH AS AFRICA, INDIA, CHINA AND BRAZIL. OFF-GRID RURAL VILLAGES AND ISOLATED ISLANDS AREAS REQUIRE MCHP AND TRIGENERATION SOLAR POWER PLANTS AND ASSOCIATED ISOLATED SMART MICROGRID SOLUTIONS TO SERVE THE COMMUNITY ENERGY NEEDS. THIS ARTICLE DESCRIBES THE DEVELOPMENT PROGRESS FOR SUCH A SYSTEM, ALSO REFERRED TO AS SOLAR POLYGENERATION. THE SYSTEM INCLUDES A SUN TRACKER MECHANISM WHEREIN A PARABOLIC DISH OR LENSES ARE GUIDED BY A LIGHT SENSITIVE MECHANIQUE IN A WAY THAT THE SOLAR RECEIVER IS ALWAYS AT RIGHT ANGLE TO THE SOLAR RADIATION. SOLAR THERMAL ENERGY IS THEN EITHER CONVERTED INTO ELECTRICAL ENERGY THROUGH A FREE PISTON STIRLING, OR STORED IN A THERMAL STORAGE CONTAINER. THE PROJECT INCLUDES THE THERMODYNAMIC MODELING OF THE PLANT IN MATLAB SIMULINK AS WELL AS THE DEVELOPMENT OF AN INTELLIGENT CONTROL APPROACH THAT INCLUDES SMART MICROGRID DISTRIBUTION AND OPTIMIZATION. THE BOOK INCLUDES ASPECTS IN THE

SIMULATION AND OPTIMIZATION OF STAND-ALONE HYBRID RENEWABLE ENERGY SYSTEMS AND CO-GENERATION IN ISOLATED OR ISLANDED MICROGRIDS. IT FOCUSSES ON THE STEPWISE DEVELOPMENT OF A HYBRID SOLAR DRIVEN MICRO COMBINED COOLING HEATING AND POWER (MCCHP) COMPACT TRIGENERATION POLYGENERATION AND THERMAL ENERGY STORAGE (TES) SYSTEM WITH INTELLIGENT WEATHER PREDICTION, WEAK-AHEAD SCHEDULING (TIME HORIZON), AND LOOK-AHEAD DISPATCH ON INTEGRATED SMART MICROGRID DISTRIBUTION PRINCIPLES. THE SOLAR HARVESTING AND SOLAR THERMODYNAMIC SYSTEM INCLUDES AN AUTOMATIC SUN TRACKING PLATFORM BASED ON A PLC CONTROLLED MECHATRONIC SUN TRACKING SYSTEM THAT FOLLOWS THE SUN PROGRESSING ACROSS THE SKY. AN INTELLIGENT ENERGY MANAGEMENT AND ADAPTIVE LEARNING CONTROL OPTIMIZATION APPROACH IS PROPOSED FOR AUTONOMOUS OFF-GRID REMOTE POWER APPLICATIONS, BOTH FOR THERMODYNAMIC OPTIMIZATION AND SMART MICRO-GRID OPTIMIZATION FOR DISTRIBUTED ENERGY RESOURCES (DER). THE CORRECT RESOLUTION OF THIS LOAD-FOLLOWING MULTI OBJECTIVE OPTIMIZATION PROBLEM IS A COMPLEX TASK BECAUSE OF THE HIGH NUMBER AND MULTI-DIMENSIONAL VARIABLES, THE CROSS-CORRELATION AND INTERDEPENDENCY BETWEEN THE ENERGY STREAMS AS WELL AS THE NON-LINEARITY IN THE PERFORMANCE OF SOME OF THE SYSTEM COMPONENTS. EXERGY-BASED CONTROL APPROACHES FOR SMARTGRID TOPOLOGIES ARE CONSIDERED IN TERMS OF THE INTELLIGENCE BEHIND THE SAFE AND RELIABLE OPERATION OF A MICROGRID IN AN AUTOMATED SYSTEM THAT CAN MANAGE ENERGY FLOW IN ELECTRICAL AS WELL AS THERMAL ENERGY SYSTEMS. THE STANDALONE MICRO-GRID SOLUTION WOULD BE SUITABLE FOR A RURAL VILLAGE, INTELLIGENT BUILDING, DISTRICT ENERGY SYSTEM, CAMPUS POWER, SHOPPING MALL CENTRE, ISOLATED NETWORK, ECO ESTATE OR REMOTE ISLAND APPLICATION SETTING WHERE SELF-GENERATION AND DECENTRALIZED ENERGY SYSTEM CONCEPTS PLAY A ROLE. DISCRETE DIGITAL SIMULATION MODELS FOR THE THERMODYNAMIC AND ACTIVE DEMAND SIDE MANAGEMENT SYSTEMS WITH DIGITAL SMARTGRID CONTROL UNIT TO OPTIMIZE THE SYSTEM ENERGY MANAGEMENT IS CURRENTLY UNDER DEVELOPMENT. PARAMETRIC SIMULATION MODELS FOR THIS TRIGENERATION SYSTEM (POLYGENERATION, POLIGENERATION, QUADGENERATION) ARE DEVELOPED ON THE MATLAB SIMULINK AND TrnSYS PLATFORMS. IN TERMS OF MODEL PREDICTIVE CODING STRATEGIES, THE AUTOMATION CONTROLLER WILL PERFORM MULTI-OBJECTIVE COST OPTIMIZATION FOR ENERGY MANAGEMENT ON A MICROGRID LEVEL BY MANAGING THE GENERATION AND STORAGE OF ELECTRICAL, HEAT AND COOLING ENERGIES IN LAYERS. EACH LAYER HAS ITS OWN SET OF SMART MICROGRID PRIORITIES ASSOCIATED WITH USER DEMAND SIDE CYCLE PREDICTIONS. MIXED INTEGER LINEAR PROGRAMMING AND NEURAL NETWORK ALGORITHMS ARE BEING MODELED TO PERFORM MULTI OBJECTIVE CONTROL OPTIMIZATION AS POTENTIAL OPTIMIZATION AND ADAPTIVE LEARNING TECHNIQUES.



AND TRACE, THIS BOOK EXPLAINS THAT THE SUN'S DAILY PATH ACROSS THE SKY IS DIRECTED BY RELATIVELY SIMPLE PRINCIPLES, AND IF GRASPED/UNDERSTOOD, THEN IT IS RELATIVELY EASY TO TRACE THE SUN WITH SUN FOLLOWING SOFTWARE. SUN POSITION COMPUTER SOFTWARE FOR TRACING THE SUN ARE AVAILABLE AS OPEN SOURCE CODE, SOURCES THAT IS LISTED IN THIS BOOK. IRONICALLY THERE WAS EVEN A SYSTEM CALLED SUN CHASER, SAID TO HAVE BEEN A SOLAR POSITIONER SYSTEM KNOWN FOR CHASING THE SUN THROUGHOUT THE DAY. USING SOLAR EQUATIONS IN AN ELECTRONIC CIRCUIT FOR AUTOMATIC SOLAR TRACKING IS QUITE SIMPLE, EVEN IF YOU ARE A NOVICE, BUT MATHEMATICAL SOLAR EQUATIONS ARE OVER COMPLICATED BY ACADEMIC EXPERTS AND PROFESSORS IN TEXT-BOOKS, JOURNAL ARTICLES AND INTERNET WEBSITES. IN TERMS OF SOLAR HOBBIES, SCHOLARS, STUDENTS AND HOBBYIST'S LOOKING AT SOLAR TRACKING ELECTRONICS OR PC PROGRAMS FOR SOLAR TRACKING ARE USUALLY OVERCOME BY THE SHEER VOLUME OF SCIENTIFIC MATERIAL AND INTERNET RESOURCES, WHICH LEAVES MANY DEVELOPERS IN FRUSTRATION WHEN SEARCH FOR SIMPLE EXPERIMENTAL SOLAR TRACKING SOURCE-CODE FOR THEIR ON-AXIS SUN-TRACKING SYSTEMS. THIS BOOKLET WILL SIMPLIFY THE SEARCH FOR THE MYSTICAL SUN TRACKING FORMULAS FOR YOUR SUN TRACKER INNOVATION AND HELP YOU DEVELOP YOUR OWN AUTONOMOUS SOLAR TRACKING CONTROLLER. BY DIRECTING THE SOLAR COLLECTOR DIRECTLY INTO THE SUN, A SOLAR HARVESTING MEANS OR DEVICE CAN HARNESS SUNLIGHT OR THERMAL HEAT. THIS IS ACHIEVED WITH THE HELP OF SUN ANGLE FORMULAS, SOLAR ANGLE FORMULAS OR SOLAR TRACKING PROCEDURES FOR THE CALCULATION OF SUN'S POSITION IN THE SKY. AUTOMATIC SUN TRACKING SYSTEM SOFTWARE INCLUDES ALGORITHMS FOR SOLAR ALTITUDE AZIMUTH ANGLE CALCULATIONS REQUIRED IN FOLLOWING THE SUN ACROSS THE SKY. IN USING THE LONGITUDE, LATITUDE GPS COORDINATES OF THE SOLAR TRACKER LOCATION, THESE SUN TRACKING SOFTWARE TOOLS SUPPORTS PRECISION SOLAR TRACKING BY DETERMINING THE SOLAR ALTITUDE-AZIMUTH COORDINATES FOR THE SUN TRAJECTORY IN ALTITUDE-AZIMUTH TRACKING AT THE TRACKER LOCATION, USING CERTAIN SUN ANGLE FORMULAS IN SUN VECTOR CALCULATIONS. INSTEAD OF FOLLOW THE SUN SOFTWARE, A SUN TRACKING SENSOR SUCH AS A SUN SENSOR OR WEBCAM OR VIDEO CAMERA WITH VISION BASED SUN FOLLOWING IMAGE PROCESSING SOFTWARE CAN ALSO BE USED TO DETERMINE THE POSITION OF THE SUN OPTICALLY. SUCH OPTICAL FEEDBACK DEVICES ARE OFTEN USED IN SOLAR PANEL TRACKING SYSTEMS AND DISH TRACKING SYSTEMS. DYNAMIC SUN TRACING IS ALSO USED IN SOLAR SURVEYING, DNI ANALYSER AND SUN SURVEYING SYSTEMS THAT BUILD SOLAR INFOGRAPHICS MAPS WITH SOLAR RADIANCE, IRRADIANCE AND DNI MODELS FOR GIS (GEOGRAPHICAL INFORMATION SYSTEM). IN THIS WAY GEOSPATIAL METHODS ON SOLAR/ENVIRONMENT INTERACTION MAKES USE OF GEOSPATIAL TECHNOLOGIES (GIS, REMOTE SENSING, AND CARTOGRAPHY).

CLIMATIC DATA AND WEATHER STATION OR WEATHER CENTER DATA, AS WELL AS QUERIES FROM SKY SERVERS AND SOLAR RESOURCE DATABASE SYSTEMS (I.E. ON DB2, SYBASE, ORACLE, SQL, MySQL) MAY ALSO BE ASSOCIATED WITH SOLAR GIS MAPS. IN SUCH SOLAR RESOURCE MODELLING SYSTEMS, A PYRANOMETER OR SOLARIMETER IS NORMALLY USED IN ADDITION TO MEASURE DIRECT AND INDIRECT, SCATTERED, DISPERSED, REFLECTIVE RADIATION FOR A PARTICULAR GEOGRAPHICAL LOCATION. SUNLIGHT ANALYSIS IS IMPORTANT IN FLASH PHOTOGRAPHY WHERE PHOTOGRAPHIC LIGHTING ARE IMPORTANT FOR PHOTOGRAPHERS. GIS SYSTEMS ARE USED BY ARCHITECTS WHO ADD SUN SHADOW APPLETS TO STUDY ARCHITECTURAL SHADING OR SUN SHADOW ANALYSIS, SOLAR FLUX CALCULATIONS, OPTICAL MODELLING OR TO PERFORM WEATHER MODELLING. SUCH SYSTEMS OFTEN EMPLOY A COMPUTER OPERATED TELESCOPE TYPE MECHANISM WITH RAY TRACING PROGRAM SOFTWARE AS A SOLAR NAVIGATOR OR SUN TRACER THAT DETERMINES THE SOLAR POSITION AND INTENSITY. THE PURPOSE OF THIS BOOKLET IS TO ASSIST DEVELOPERS TO TRACK AND TRACE SUITABLE SOURCE-CODE AND SOLAR TRACKING ALGORITHMS FOR THEIR APPLICATION, WHETHER A HOBBYIST, SCIENTIST, TECHNICIAN OR ENGINEER. MANY OPEN-SOURCE SUN FOLLOWING AND TRACKING ALGORITHMS AND SOURCE-CODE FOR SOLAR TRACKING PROGRAMS AND MODULES ARE FREELY AVAILABLE TO DOWNLOAD ON THE INTERNET TODAY. CERTAIN PROPRIETARY SOLAR TRACKER KITS AND SOLAR TRACKING CONTROLLERS INCLUDE A SOFTWARE DEVELOPMENT KIT SDK FOR ITS APPLICATION PROGRAMMING INTERFACE API ATTRIBUTES (PEBBLE). WIDGET LIBRARIES, WIDGET TOOLKITS, GUI TOOLKIT AND UX LIBRARIES WITH GRAPHICAL CONTROL ELEMENTS ARE ALSO AVAILABLE TO CONSTRUCT THE GRAPHICAL USER INTERFACE (GUI) FOR YOUR SOLAR TRACKING OR SOLAR POWER MONITORING PROGRAM. THE SOLAR LIBRARY USED BY SOLAR POSITION CALCULATORS, SOLAR SIMULATION SOFTWARE AND SOLAR CONTOUR CALCULATORS INCLUDE MACHINE PROGRAM CODE FOR THE SOLAR HARDWARE CONTROLLER WHICH ARE SOFTWARE PROGRAMMED INTO MICRO-CONTROLLERS, PROGRAMMABLE LOGIC CONTROLLERS PLC, PROGRAMMABLE GATE ARRAYS, ARDUINO PROCESSOR OR PIC PROCESSOR. PC BASED SOLAR TRACKING IS ALSO HIGH IN DEMAND USING C++, VISUAL BASIC VB, AS WELL AS MS WINDOWS, LINUX AND APPLE MAC BASED OPERATING SYSTEMS FOR SUN PATH TABLES ON MATLAB, EXCEL. SOME BOOKS AND INTERNET WEBPAGES USE OTHER TERMS, SUCH AS: SUN ANGLE CALCULATOR, SUN POSITION CALCULATOR OR SOLAR ANGLE CALCULATOR. AS SAID, SUCH SOFTWARE CODE CALCULATE THE SOLAR AZIMUTH ANGLE, SOLAR ALTITUDE ANGLE, SOLAR ELEVATION ANGLE OR THE SOLAR ZENITH ANGLE (ZENITH SOLAR ANGLE IS SIMPLY REFERENCED FROM VERTICAL PLANE, THE MIRROR OF THE ELEVATION ANGLE MEASURED FROM THE HORIZONTAL OR GROUND PLANE LEVEL). SIMILAR SOFTWARE CODE IS ALSO USED IN SOLAR CALCULATOR APPS OR THE SOLAR POWER CALCULATOR APPS FOR IOS AND ANDROID

SMARTPHONE DEVICES. MOST OF THESE SMARTPHONE SOLAR MOBILE APPS SHOW THE SUN PATH AND SUN-ANGLES FOR ANY LOCATION AND DATE OVER A 24 HOUR PERIOD. SOME SMARTPHONES INCLUDE AUGMENTED REALITY FEATURES IN WHICH YOU CAN PHYSICALLY SEE AND LOOK AT THE SOLAR PATH THROUGH YOUR CELL PHONE CAMERA OR MOBILE PHONE CAMERA AT YOUR PHONE'S SPECIFIC GPS LOCATION. IN THE COMPUTER PROGRAMMING AND DIGITAL SIGNAL PROCESSING (DSP) ENVIRONMENT, (FREE/OPEN SOURCE) PROGRAM CODE ARE AVAILABLE FOR VB, .NET, DELPHI, PYTHON, C, C+, C++, PHP, SWIFT, ADM, F, FLASH, BASIC, QBASIC, GBASIC, KBASIC, SIMPL LANGUAGE, SQUIRREL, SOLARIS, ASSEMBLY LANGUAGE ON OPERATING SYSTEMS SUCH AS MS WINDOWS, APPLE MAC, DOS OR LINUX OS. SOFTWARE ALGORITHMS PREDICTING POSITION OF THE SUN IN THE SKY ARE COMMONLY AVAILABLE AS GRAPHICAL PROGRAMMING PLATFORMS SUCH AS MATLAB (MATHWORKS), SIMULINK MODELS, JAVA APPLETS, TRNSYS SIMULATIONS, SCADA SYSTEM APPS, LABVIEW MODULE, BECKHOFF TWINCAT (VISUAL STUDIO), SIEMENS SPA, MOBILE AND IPHONE APPS, ANDROID OR IOS TABLET APPS, AND SO FORTH. AT THE SAME TIME, PLC SOFTWARE CODE FOR A RANGE OF SUN TRACKING AUTOMATION TECHNOLOGY CAN FOLLOW THE PROFILE OF SUN IN SKY FOR SIEMENS, HP, PANASONIC, ABB, ALLAN BRADLEY, OMRON, SEW, FESTO, BECKHOFF, ROCKWELL, SCHNEIDER, ENDRESS HAUSER, FUDJI ELECTRIC. HONEYWELL, FUCHS, YOKONAWA, OR MUTHIBISHI PLATFORMS. SUN PATH PROJECTION SOFTWARE ARE ALSO AVAILABLE FOR A RANGE OF MODULAR IPC EMBEDDED PC MOTHERBOARDS, INDUSTRIAL PC, PLC (PROGRAMMABLE LOGIC CONTROLLER) AND PAC (PROGRAMMABLE AUTOMATION CONTROLLER) SUCH AS THE SIEMENS S7-1200 OR SIEMENS LOGO, BECKHOFF IPC OR CX SERIES, OMRON PLC, ERCAM PLC, AC500PLC ABB, NATIONAL INSTRUMENTS NI PXI OR NI cRIO, PIC PROCESSOR, INTEL 8051/8085, IBM (CELL, POWER, BRAIN OR TRUENORTH SERIES), FPGA (XILINX ALTERA NIOS), INTEL, XEON, ATMEL MEGA AVR, MPU, MAPLE, TEENSY, MSP, XMOS, XBEE, ARM, RASPBERRY PI, EAGLE, ARDUINO OR ARDUINO ATMEGA MICROCONTROLLER, WITH SERVO MOTOR, STEPPER MOTOR, DIRECT CURRENT DC PULSE WIDTH MODULATION PWM (CURRENT DRIVER) OR ALTERNATING CURRENT AC SPS OR IPC VARIABLE FREQUENCY DRIVES VFD MOTOR DRIVES (ALSO TERMED ADJUSTABLE-FREQUENCY DRIVE, VARIABLE-SPEED DRIVE, AC DRIVE, MICRO DRIVE OR INVERTER DRIVE) FOR ELECTRICAL, MECHATRONIC, PNEUMATIC, OR HYDRAULIC SOLAR TRACKING ACTUATORS. THE ABOVE MOTION CONTROL AND ROBOT CONTROL SYSTEMS INCLUDE ANALOGUE OR DIGITAL INTERFACING PORTS ON THE PROCESSORS TO ALLOW FOR TRACKER ANGLE ORIENTATION FEEDBACK CONTROL THROUGH ONE OR A COMBINATION OF ANGLE SENSOR OR ANGLE ENCODER, SHAFT ENCODER, PRECISION ENCODER, OPTICAL ENCODER, MAGNETIC ENCODER, DIRECTION ENCODER, ROTATIONAL ENCODER, CHIP ENCODER, TILT SENSOR, INCLINATION SENSOR, OR PITCH SENSOR. NOTE THAT THE

TRACKER'S ELEVATION OR ZENITH AXIS ANGLE MAY MEASURED USING AN ALTITUDE ANGLE-, DECLINATION ANGLE-, INCLINATION ANGLE-, PITCH ANGLE-, OR VERTICAL ANGLE-, ZENITH ANGLE- SENSOR OR INCLINOMETER. SIMILARLY THE TRACKER'S AZIMUTH AXIS ANGLE BE MEASURED WITH A AZIMUTH ANGLE-, HORIZONTAL ANGLE-, OR ROLL ANGLE- SENSOR. CHIP INTEGRATED ACCELEROMETER MAGNETOMETER GYROSCOPE TYPE ANGLE SENSORS CAN ALSO BE USED TO CALCULATE DISPLACEMENT. OTHER OPTIONS INCLUDE THE USE OF THERMAL IMAGING SYSTEMS SUCH AS A FLUKE THERMAL IMAGER, OR ROBOTIC OR VISION BASED SOLAR TRACKER SYSTEMS THAT EMPLOY FACE TRACKING, HEAD TRACKING, HAND TRACKING, EYE TRACKING AND CAR TRACKING PRINCIPLES IN SOLAR TRACKING. WITH UNATTENDED DECENTRALISED RURAL, ISLAND, ISOLATED, OR AUTONOMOUS OFF-GRID POWER INSTALLATIONS, REMOTE CONTROL, MONITORING, DATA ACQUISITION, DIGITAL DATALOGGING AND ONLINE MEASUREMENT AND VERIFICATION EQUIPMENT BECOMES CRUCIAL. IT ASSISTS THE OPERATOR WITH SUPERVISORY CONTROL TO MONITOR THE EFFICIENCY OF REMOTE RENEWABLE ENERGY RESOURCES AND SYSTEMS AND PROVIDE VALUABLE WEB-BASED FEEDBACK IN TERMS OF CO<sub>2</sub> AND CLEAN DEVELOPMENT MECHANISM (CDM) REPORTING. A POWER QUALITY ANALYSER FOR DIAGNOSTICS THROUGH INTERNET, WIFI AND CELLULAR MOBILE LINKS IS MOST VALUABLE IN FRONTLINE TROUBLESHOOTING AND PREDICTIVE MAINTENANCE, WHERE QUICK DIAGNOSTIC ANALYSIS IS REQUIRED TO DETECT AND PREVENT POWER QUALITY ISSUES. SOLAR TRACKER APPLICATIONS COVER A WIDE SPECTRUM OF SOLAR APPLICATIONS AND SOLAR ASSISTED APPLICATION, INCLUDING CONCENTRATED SOLAR POWER GENERATION, SOLAR DESALINATION, SOLAR WATER PURIFICATION, SOLAR STEAM GENERATION, SOLAR ELECTRICITY GENERATION, SOLAR INDUSTRIAL PROCESS HEAT, SOLAR THERMAL HEAT STORAGE, SOLAR FOOD DRYERS, SOLAR WATER PUMPING, HYDROGEN PRODUCTION FROM METHANE OR PRODUCING HYDROGEN AND OXYGEN FROM WATER (HHO) THROUGH ELECTROLYSIS. MANY PATENTED OR NON-PATENTED SOLAR APPARATUS INCLUDE TRACKING IN SOLAR APPARATUS FOR SOLAR ELECTRIC GENERATOR, SOLAR DESALINATOR, SOLAR STEAM ENGINE, SOLAR ICE MAKER, SOLAR WATER PURIFIER, SOLAR COOLING, SOLAR REFRIGERATION, USB SOLAR CHARGER, SOLAR PHONE CHARGING, PORTABLE SOLAR CHARGING TRACKER, SOLAR COFFEE BREWING, SOLAR COOKING OR SOLAR DYING MEANS. YOUR PROJECT MAY BE THE NEXT BREAKTHROUGH OR PATENT, BUT YOUR INVENTION IS HELD BACK BY FRUSTRATION IN SEARCH FOR THE SUN TRACKER YOU REQUIRE FOR YOUR SOLAR POWERED APPLIANCE, SOLAR GENERATOR, SOLAR TRACKER ROBOT, SOLAR FREEZER, SOLAR COOKER, SOLAR DRIER, SOLAR PUMP, SOLAR FREEZER, OR SOLAR DRYER PROJECT. WHETHER YOUR SOLAR ELECTRONIC CIRCUIT DIAGRAM INCLUDE A SIMPLIFIED SOLAR CONTROLLER DESIGN IN A SOLAR ELECTRICITY PROJECT, SOLAR POWER KIT, SOLAR HOBBY KIT, SOLAR STEAM GENERATOR, SOLAR HOT WATER SYSTEM, SOLAR ICE MAKER, SOLAR DESALINATOR,

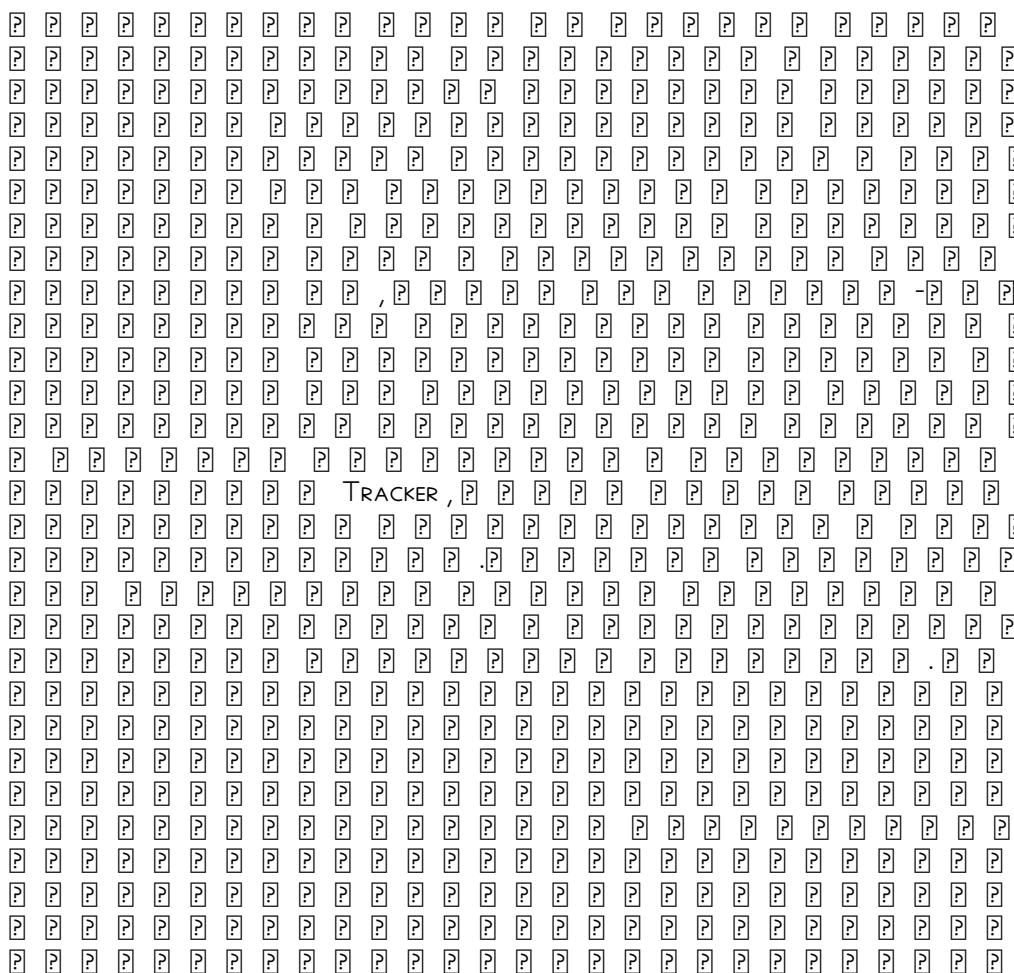
HOBBYIST SOLAR PANELS, HOBBY ROBOT, OR IF YOU ARE DEVELOPING PROFESSIONAL OR HOBBY ELECTRONICS FOR A SOLAR UTILITY OR MICRO SCALE SOLAR POWERPLANT FOR YOUR OWN SOLAR FARM OR SOLAR FARMING, THIS PUBLICATION MAY HELP ACCELERATE THE DEVELOPMENT OF YOUR SOLAR TRACKING INNOVATION. LATELY, SOLAR POLYGENERATION, SOLAR TRIGENERATION (SOLAR TRIPLE GENERATION), AND SOLAR QUAD GENERATION (ADDING DELIVERY OF STEAM, LIQUID/GASEOUS FUEL, OR CAPTURE FOOD-GRADE CO<sub>2</sub>) SYSTEMS HAVE NEED FOR AUTOMATIC SOLAR TRACKING. THESE SYSTEMS ARE KNOWN FOR SIGNIFICANT EFFICIENCY INCREASES IN ENERGY YIELD AS A RESULT OF THE INTEGRATION AND RE-USE OF WASTE OR RESIDUAL HEAT AND ARE SUITABLE FOR COMPACT PACKAGED MICRO SOLAR POWERPLANTS THAT COULD BE MANUFACTURED AND TRANSPORTED IN KIT-FORM AND OPERATE ON A PLUG-AND PLAY BASIS. TYPICAL HYBRID SOLAR POWER SYSTEMS INCLUDE COMPACT OR PACKAGED SOLAR MICRO COMBINED HEAT AND POWER (CHP OR MCHP) OR SOLAR MICRO COMBINED, COOLING, HEATING AND POWER (CCHP, CHPC, MCCHP, OR MCHPC) SYSTEMS USED IN DISTRIBUTED POWER GENERATION. THESE SYSTEMS ARE OFTEN COMBINED IN CONCENTRATED SOLAR CSP AND CPV SMART MICROGRID CONFIGURATIONS FOR OFF-GRID RURAL, ISLAND OR ISOLATED MICROGRID, MINIGRID AND DISTRIBUTED POWER RENEWABLE ENERGY SYSTEMS. SOLAR TRACKING ALGORITHMS ARE ALSO USED IN MODELLING OF TRIGENERATION SYSTEMS USING MATLAB SIMULINK (MODELICA OR TRNSYS) PLATFORM AS WELL AS IN AUTOMATION AND CONTROL OF RENEWABLE ENERGY SYSTEMS THROUGH INTELLIGENT PARSING, MULTI-OBJECTIVE, ADAPTIVE LEARNING CONTROL AND CONTROL OPTIMIZATION STRATEGIES. SOLAR TRACKING ALGORITHMS ALSO FIND APPLICATION IN DEVELOPING SOLAR MODELS FOR COUNTRY OR LOCATION SPECIFIC SOLAR STUDIES, FOR EXAMPLE IN TERMS OF MEASURING OR ANALYSIS OF THE FLUCTUATIONS OF THE SOLAR RADIATION (I.E. DIRECT AND DIFFUSE RADIATION) IN A PARTICULAR AREA. SOLAR DNI, SOLAR IRRADIANCE AND ATMOSPHERIC INFORMATION AND MODELS CAN THUS BE INTEGRATED INTO A SOLAR MAP, SOLAR ATLAS OR GEOGRAPHICAL INFORMATION SYSTEMS (GIS). SUCH MODELS ALLOW FOR DEFINING LOCAL PARAMETERS FOR SPECIFIC REGIONS THAT MAY BE VALUABLE IN TERMS OF THE EVALUATION OF DIFFERENT SOLAR IN PHOTOVOLTAIC OF CSP SYSTEMS ON SIMULATION AND SYNTHESIS PLATFORMS SUCH AS MATLAB AND SIMULINK OR IN LINEAR OR MULTI-OBJECTIVE OPTIMIZATION ALGORITHM PLATFORMS SUCH AS COMPOSE, ENERGYPLAN OR DER-CAM. A DUAL-AXIS SOLAR TRACKER AND SINGLE-AXIS SOLAR TRACKER MAY USE A SUN TRACKER PROGRAM OR SUN TRACKER ALGORITHM TO POSITION A SOLAR DISH, SOLAR PANEL ARRAY, HELIOSTAT ARRAY, PV PANEL, SOLAR ANTENNA OR INFRARED SOLAR NANTENNA. A SELF-TRACKING SOLAR CONCENTRATOR PERFORMS AUTOMATIC SOLAR TRACKING BY COMPUTING THE SOLAR VECTOR. SOLAR POSITION ALGORITHMS (TWINCAT, SPA, OR PSA ALGORITHMS) USE AN ASTRONOMICAL ALGORITHM TO CALCULATE THE



POSITION OF THE SUN. IT USES ASTRONOMICAL SOFTWARE ALGORITHMS AND EQUATIONS FOR SOLAR TRACKING IN THE CALCULATION OF SUN'S POSITION IN THE SKY FOR EACH LOCATION ON THE EARTH AT ANY TIME OF DAY. LIKE AN OPTICAL SOLAR TELESCOPE, THE SOLAR POSITION ALGORITHM PIN-POINTS THE SOLAR REFLECTOR AT THE SUN AND LOCKS ONTO THE SUN'S POSITION TO TRACK THE SUN ACROSS THE SKY AS THE SUN PROGRESSES THROUGHOUT THE DAY. OPTICAL SENSORS SUCH AS PHOTODIODES, LIGHT-DEPENDANT-RESISTORS (LDR) OR PHOTORESISTORS ARE USED AS OPTICAL ACCURACY FEEDBACK DEVICES. LATELY WE ALSO INCLUDED A SECTION IN THE BOOK (WITH LINKS TO MICROPROCESSOR CODE) ON HOW THE PIXART WII INFRARED CAMERA IN THE WII REMOTE OR WIIMOTE MAY BE USED IN INFRARED SOLAR TRACKING APPLICATIONS. IN ORDER TO HARVEST FREE ENERGY FROM THE SUN, SOME AUTOMATIC SOLAR POSITIONING SYSTEMS USE AN OPTICAL MEANS TO DIRECT THE SOLAR TRACKING DEVICE. THESE SOLAR TRACKING STRATEGIES USE OPTICAL TRACKING TECHNIQUES, SUCH AS A SUN SENSOR MEANS, TO DIRECT SUN RAYS ONTO A SILICON OR CMOS SUBSTRATE TO DETERMINE THE X AND Y COORDINATES OF THE SUN'S POSITION. IN A SOLAR MEMS SUN-SENSOR DEVICE, INCIDENT SUNLIGHT ENTERS THE SUN SENSOR THROUGH A SMALL PIN-HOLE IN A MASK PLATE WHERE LIGHT IS EXPOSED TO A SILICON SUBSTRATE. IN A WEB-CAMERA OR CAMERA IMAGE PROCESSING SUN TRACKING AND SUN FOLLOWING MEANS, OBJECT TRACKING SOFTWARE PERFORMS MULTI OBJECT TRACKING OR MOVING OBJECT TRACKING METHODS. IN AN SOLAR OBJECT TRACKING TECHNIQUE, IMAGE PROCESSING SOFTWARE PERFORMS MATHEMATICAL PROCESSING TO BOX THE OUTLINE OF THE APPARENT SOLAR DISC OR SUN BLOB WITHIN THE CAPTURED IMAGE FRAME, WHILE SUN-LOCALIZATION IS PERFORMED WITH AN EDGE DETECTION ALGORITHM TO DETERMINE THE SOLAR VECTOR COORDINATES. AN AUTOMATED POSITIONING SYSTEM HELP MAXIMIZE THE YIELDS OF SOLAR POWER PLANTS THROUGH SOLAR TRACKING CONTROL TO HARNESS SUN'S ENERGY. IN SUCH RENEWABLE ENERGY SYSTEMS, THE SOLAR PANEL POSITIONING SYSTEM USES A SUN TRACKING TECHNIQUES AND A SOLAR ANGLE CALCULATOR IN POSITIONING PV PANELS IN PHOTOVOLTAIC SYSTEMS AND CONCENTRATED PHOTOVOLTAIC CPV SYSTEMS. AUTOMATIC ON-AXIS SOLAR TRACKING IN A PV SOLAR TRACKING SYSTEM CAN BE DUAL-AXIS SUN TRACKING OR SINGLE-AXIS SUN SOLAR TRACKING. IT IS KNOWN THAT A MOTORIZED POSITIONING SYSTEM IN A PHOTOVOLTAIC PANEL TRACKER INCREASE ENERGY YIELD AND ENSURES INCREASED POWER OUTPUT, EVEN IN A SINGLE AXIS SOLAR TRACKING CONFIGURATION. OTHER APPLICATIONS SUCH AS ROBOTIC SOLAR TRACKER OR ROBOTIC SOLAR TRACKING SYSTEM USES ROBOTICA WITH ARTIFICIAL INTELLIGENCE IN THE CONTROL OPTIMIZATION OF ENERGY YIELD IN SOLAR HARVESTING THROUGH A ROBOTIC TRACKING SYSTEM. AUTOMATIC POSITIONING SYSTEMS IN SOLAR TRACKING DESIGNS ARE ALSO USED IN OTHER FREE ENERGY GENERATORS, SUCH AS CONCENTRATED SOLAR THERMAL POWER CSP AND

DISH STIRLING SYSTEMS. THE SUN TRACKING DEVICE IN A SOLAR COLLECTOR IN A SOLAR CONCENTRATOR OR SOLAR COLLECTOR SUCH A PERFORMS ON-AXIS SOLAR TRACKING, A DUAL AXIS SOLAR TRACKER ASSISTS TO HARNESS ENERGY FROM THE SUN THROUGH AN OPTICAL SOLAR COLLECTOR, WHICH CAN BE A PARABOLIC MIRROR, PARABOLIC REFLECTOR, FRESNEL LENS OR MIRROR ARRAY/MATRIX. A PARABOLIC DISH OR REFLECTOR IS DYNAMICALLY STEERED USING A TRANSMISSION SYSTEM OR SOLAR TRACKING SLEW DRIVE MEAN. IN STEERING THE DISH TO FACE THE SUN, THE POWER DISH ACTUATOR AND ACTUATION MEANS IN A PARABOLIC DISH SYSTEM OPTICALLY FOCUSSES THE SUN'S ENERGY ON THE FOCAL POINT OF A PARABOLIC DISH OR SOLAR CONCENTRATING MEANS. A STIRLING ENGINE, SOLAR HEAT PIPE, THERMOSYPHIN, SOLAR PHASE CHANGE MATERIAL PCM RECEIVER, OR A FIBRE OPTIC SUNLIGHT RECEIVER MEANS IS LOCATED AT THE FOCAL POINT OF THE SOLAR CONCENTRATOR. THE DISH STIRLING ENGINE CONFIGURATION IS REFERRED TO AS A DISH STIRLING SYSTEM OR STIRLING POWER GENERATION SYSTEM. HYBRID SOLAR POWER SYSTEMS (USED IN COMBINATION WITH BIOGAS, BIOFUEL, PETROL, ETHANOL, DIESEL, NATURAL GAS OR PNG) USE A COMBINATION OF POWER SOURCES TO HARNESS AND STORE SOLAR ENERGY IN A STORAGE MEDIUM. ANY MULTITUDE OF ENERGY SOURCES CAN BE COMBINED THROUGH THE USE OF CONTROLLERS AND THE ENERGY STORED IN BATTERIES, PHASE CHANGE MATERIAL, THERMAL HEAT STORAGE, AND IN COGENERATION FORM CONVERTED TO THE REQUIRED POWER USING THERMODYNAMIC CYCLES (ORGANIC RANKIN, BRAYTON CYCLE, MICRO TURBINE, STIRLING) WITH AN INVERTER AND CHARGE CONTROLLER.

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DECODING **IPONE SATELLITE DIRECT APP**: REVEALING THE CAPTIVATING POTENTIAL OF VERBAL EXPRESSION

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