**Appendix 3: PHP Program**

1 <?php

2 */\* vim: set expandtab tabstop=4 shiftwidth=4 softtabstop=4: \*/*

3

4 */\*\**

5  *\* Sort of a simulation of the PP2 program controlling the Fischer Technik in order to sort black and white discs.*

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10  *\* @since 13/3/2015*

11  *\*/*

12 **include** 'functions.php';

13 *//\*\*COMPILER\*\**

14 moveFunction('timerInterrupt', 1);

15 moveFunction('timerManage', 50);

16

17 *//\*\*DATA\*\**

18 initVar('offset', 1);

19 initVar('stackPointer', 1);

20 initVar('outputs', 12);

21 initVar('state', 1);

22

23 *//\*\*CODE\*\**

24 define('TIMEMOTORDOWN', 150); *//how long the sorter takes to move down*

25 define('BELT', 2000);

26 define('BELTROUND', 2000);*//Time for the belt to make a rotation*

27 define('SORT', 200);*//Clockticks to make a rotation*

28 define('COUNTDOWN', 30000);

29 *//outputs*

30 define('LENSLAMPPOSITION', 2);

31 define('LENSLAMPSORTER', 6);

32 define('HBRIDGE0', 0);

33 define('HBRIDGE1', 1);

34 define('CONVEYORBELT', 7);

35 define('FEEDERENGINE', 3);

36 define('DISPLAY', 8);

37 define('LEDSTATEINDICATOR', 9);

38

39 *//not a state*

40 **function** main()

41 {

42 **global** $counter, $location;

43

44 *//store the offset of the program, this is used in the interrupt*

45 storeData(R5, 'offset', 0);

46 *//install the countdown*

47 installCountdown('timerInterrupt');

48

49 *//save the location of the stackPointer, so we can clear the stack*

50 storeData(SP, 'stackPointer', 0);

51

52 *//the variables that are the same throughout the program:*

53 $counter = 0;

54 $location = 0;

55 $sleep = 0;

56

57

58 *//stop everything*

59 $temp = 0;

60 storeData($temp, 'outputs', HBRIDGE1);

61 storeData($temp, 'outputs', LENSLAMPPOSITION);

62 storeData($temp, 'outputs', LENSLAMPSORTER);

63 storeData($temp, 'outputs', LEDSTATEINDICATOR);

64 storeData($temp, 'outputs', DISPLAY);

65 storeData($temp, 'outputs', CONVEYORBELT);

66 storeData($temp, 'outputs', FEEDERENGINE);

67

68 *//sh0w the state*

69 $state = 0;

70 storeData($state, 'state', 0);

71

72 *//set HBridge so the sorter starts moving up*

73 $temp = 10;

74 storeData($temp, 'outputs', HBRIDGE0);

75 unset($temp, $state);

76

77 *//go to the first state*

78 initial();

79 }

80

81 *//state 0*

82 **function** initial()

83 {

84 **global** $sleep;

85 *//disable the lights on the right hand side*

86 $temp = 0;

87 display($temp, 'leds2');

88

89 $temp = getData('stackPointer', 0);

90 setStackPointer($temp);

91

92 timerManage();

93

94 *//check if the sorter push button is pressed*

95 $push = getButtonPressed(5);

96 **if** ($push == 1) {

97 *//move sorter down*

98 $temp = 0;

99 storeData($temp, 'outputs', HBRIDGE0);

100 $temp = 10;

101 storeData($temp, 'outputs', HBRIDGE1);

102

103 *//update state*

104 $temp = 1;

105 storeData($temp, 'state', 0);

106 unset($temp);

107

108 *//reset sleep for the next function*

109 $sleep = 0;

110 calibrateSorter();

111

112 }

113 unset($push);

114

115 *//loop*

116 initial();

117 }

118

119 *//state 1*

120 **function** calibrateSorter()

121 {

122 **global** $sleep;

123 timerManage();

124

125 *//the sorter is now moving down,*

126 *//we're waiting for it to reach its bottom position*

127 **if** ($sleep == TIMEMOTORDOWN) {

128 *//stop the sorter*

129 $temp = 0;

130 storeData($temp, 'outputs', HBRIDGE1);

131

132 *//update the state*

133 $state = 2;

134 storeData($state, 'state', 0);

135 unset($state);

136

137 *//reset sleep for the next state*

138 $sleep = 0;

139 resting();

140 }

141

142 *//loop*

143 $sleep++;

144 calibrateSorter();

145 }

146

147 *//state 2*

148 **function** resting()

149 {

150 timerManage();

151

152 *//the program is now waiting for the user to press start/stop*

153 $startStop = getButtonPressed(0);

154 **if** ($startStop == 1) {

155 *//sleep so we don't go to pause immediately*

156

157

158 *//power up the lamps*

159 $temp = 12;

160 storeData($temp, 'outputs', LENSLAMPPOSITION);

161 unset($temp);

162 timerManage();

163 sleep(1000);

164 $temp = 12;

165 storeData($temp, 'outputs', LENSLAMPSORTER);

166 unset($temp);

167 timerManage();

168 sleep(2000);

169

170

171 *//start up the belt and feeder*

172 $temp = 9;

173 storeData($temp, 'outputs', CONVEYORBELT);

174 $temp = 9;

175 storeData($temp, 'outputs', FEEDERENGINE);

176 unset($temp);

177

178 *//set and start the countdown for the moment there are no more disks*

179 *//this countdown will reset every time a disk is found*

180 *//when it triggers, timerInterrupt will be ran.*

181 setCountdown(COUNTDOWN);

182 startCountdown();

183

184 *//update the state*

185 $state = 3;

186 storeData($state, 'state', 0);

187 unset($state);

188

189 running();

190 }

191 unset($startStop);

192

193 *//loop*

194 resting();

195 }

196

197 *//state 3*

198 **function** running()

199 {

200 timerManage();

201

202 *//check if we need to pause*

203 $startStop = getButtonPressed(0);

204 **if** ($startStop == 1) {

205 *//stop the feeder engine*

206 $temp = 0;

207 storeData($temp, 'outputs', FEEDERENGINE);

208 unset($temp);

209

210 *//exit after 1 rotation of the belt*

211 setCountdown(BELT \* 10);

212

213 *//update the state*

214 $state = 9;*//TODO: echte state*

215 storeData($state, 'state', 0);

216 unset($state);

217

218 runningTimer();

219

220 }

221 unset($startStop);

222

223 *//check if a disk is at the position detector*

224 $position = getButtonPressed(7);

225 **if** ($position == 1) {

226 *//reset the countdown, because a disk was just detected*

227 setCountdown(COUNTDOWN);

228

229 *//update the state*

230 $state = 4;

231 storeData($state, 'state', 0);

232 unset($state);

233 runningWait();

234 }

235 unset($position);

236

237 *//loop*

238 running();

239 }

240

241 *//state 4*

242 **function** runningWait()

243 {

244 timerManage();

245

246 *//check if we need to pause*

247 $startStop = getButtonPressed(0);

248 **if** ($startStop == 1) {

249 *//stop the feeder engine*

250 $temp = 0;

251 storeData($temp, 'outputs', FEEDERENGINE);

252 unset($temp);

253

254 *//exit after 1 rotation of the belt*

255 setCountdown(BELT \* 10);

256

257 *//update the state*

258 $state = 9;

259 storeData($state, 'state', 0);

260 unset($state);

261

262 runningTimer();

263

264 }

265 unset($startStop);

266

267 *//check if a disk is at the position detector*

268 $position = getButtonPressed(7);

269 **if** ($position == 0) {

270 *//reset the countdown, because a disk was just detected*

271 setCountdown(COUNTDOWN);

272

273 *//update state*

274 $state = 5;

275 storeData($state, 'state', 0);

276 unset($state);

277

278 runningTimerReset();

279

280 }

281 unset($position);

282

283 *//check if a white disk is at the colour detector*

284 $colour = getButtonPressed(6);

285 **if** ($colour == 1) {

286 *//move the sorter up so the disk goes to the correct box*

287 $temp = 10;

288 storeData($temp, 'outputs', HBRIDGE0);

289

290 *//stop the feeder engine*

291 $temp = 0;

292 storeData($temp, 'outputs', FEEDERENGINE);

293 unset($temp);

294

295 *//update state*

296 $state = 6;

297 storeData($state, 'state', 0);

298 unset($state);

299

300 motorUp();

301 }

302 unset($colour);

303

304 *//loop*

305 runningWait();

306 }

307

308 *//state 5*

309 **function** runningTimerReset()

310 {

311 timerManage();

312

313 *//update state*

314 $state = 4;

315 storeData($state, 'state', 0);

316 unset($state);

317

318 runningWait();

319 }

320

321 *//state 6*

322 **function** motorUp()

323 {

324 **global** $sleep;

325 timerManage();

326

327 *//check if we need to pause*

328 $startStop = getButtonPressed(0);

329 **if** ($startStop == 1) {

330 *//stop the feeder engine*

331 $temp = 0;

332 storeData($temp, 'outputs', FEEDERENGINE);

333 unset($temp);

334

335 *//exit after 1 rotation of the belt*

336 setCountdown(BELT \* 10);

337

338 *//update the state*

339 $state = 10;

340 storeData($state, 'state', 0);

341 unset($state);

342

343 motorUpTimer();

344

345 }

346 unset($startStop);

347

348 *//check if the sorter push button is pressed*

349 $push = getButtonPressed(5);

350 **if** ($push == 1) {

351 *//stop the sorter engine, because its at its highest position*

352 $temp = 0;

353 storeData($temp, 'outputs', HBRIDGE0);

354 unset($temp);

355

356 *//update state*

357 $state = 7;

358 storeData($state, 'state', 0);

359 unset($state);

360

361 *//set sleep for the next function*

362 $sleep = 0;

363

364 whiteWait();

365 }

366 unset($push);

367

368 *//loop*

369 motorUp();

370 }

371

372 *//state 7*

373 **function** whiteWait()

374 {

375 **global** $sleep;

376 timerManage();

377

378 *//we are waiting for the white disk to be sorted*

379 **if** ($sleep == SORT) {

380 *//start moving the sorter down*

381 $temp = 10;

382 storeData($temp, 'outputs', HBRIDGE1);

383 unset($temp);

384

385 *//make sure the timerinterrupt is correct*

386 setCountdown(COUNTDOWN);

387

388 *//update state*

389 $state = 8;

390 storeData($state, 'state', 0);

391 unset($state);

392

393 *//reset sleep for the next function*

394 $sleep = 0;

395 motorDown();

396

397 }

398

399 *//check if we need to pause*

400 $startStop = getButtonPressed(0);

401 **if** ($startStop == 1) {

402 *//stop the feeder engine*

403 $temp = 0;

404 storeData($temp, 'outputs', FEEDERENGINE);

405 unset($temp);

406

407 *//exit after 1 rotation of the belt*

408 setCountdown(BELT \* 10);

409

410 *//update the state*

411 $state = 11;

412 storeData($state, 'state', 0);

413 unset($state);

414

415 whiteWaitTimer();

416 }

417 unset($startStop);

418

419 *//loop*

420 $sleep++;

421 whiteWait();

422 }

423

424 *//state 8*

425 **function** motorDown()

426 {

427 **global** $sleep;

428 timerManage();

429

430

431 *//check if a white disk is at the colour detector*

432 $colour = getButtonPressed(6);

433 **if** ($colour == 1) {

434 *//move the sorter up so the disk goes to the correct box*

435 $temp=0;

436 storeData($temp,'outputs',HBRIDGE1);

437 $temp = 10;

438 storeData($temp, 'outputs', HBRIDGE0);

439 unset($temp);

440

441 *//update state*

442 $state = 6;

443 storeData($state, 'state', 0);

444 $sleep=0;

445 unset($state);

446

447 motorUp();

448 }

449 unset($colour);

450

451

452 *//the sorter is moving down, we are waiting for that to complete*

453 **if** ($sleep == TIMEMOTORDOWN) {

454 *//stop the sorter, its where it should be*

455 $temp = 0;

456 storeData($temp, 'outputs', HBRIDGE1);

457 $temp = 7;

458 storeData($temp, 'outputs', FEEDERENGINE);

459 unset($temp);

460

461 *//update state*

462 $state = 4;

463 storeData($state, 'state', 0);

464 *//reset sleep for the next function*

465 $sleep = 0;

466 unset($state);

467

468 runningWait();

469 }

470

471 *//check if we need to pause*

472 $startStop = getButtonPressed(0);

473 **if** ($startStop == 1) {

474 *//stop the feeder engine*

475 $temp = 0;

476 storeData($temp, 'outputs', FEEDERENGINE);

477 unset($temp);

478

479 *//exit after 1 rotation of the belt*

480 setCountdown(BELT \* 10);

481

482 *//update the state*

483 $state = 12;

484 storeData($state, 'state', 0);

485 unset($state);

486

487 motorDownTimer();

488 }

489 unset($startStop);

490

491 *//loop*

492 $sleep++;

493 motorDown();

494

495 }

496

497 *//state 9*

498 **function** runningTimer()

499 {

500 timerManage();

501

502 *//update state*

503 $state = 13;

504 storeData($state, 'state', 0);

505 unset($state);

506

507 runningStop();

508 }

509

510 *//state 10*

511 **function** motorUpTimer()

512 {

513 timerManage();

514

515 *//update state*

516 $state = 14;

517 storeData($state, 'state', 0);

518 unset($state);

519

520 motorUpStop();

521 }

522

523 *//state 11*

524 **function** whiteWaitTimer()

525 {

526 timerManage();

527

528 *//update state*

529 $state = 15;

530 storeData($state, 'state', 0);

531 unset($state);

532

533 whiteWaitStop();

534 }

535

536 *//state 12*

537 **function** motorDownTimer()

538 {

539 timerManage();

540

541 *//update state*

542 $state = 16;

543 storeData($state, 'state', 0);

544 unset($state);

545

546 motorDownStop();

547 }

548

549 *//state 13*

550 **function** runningStop()

551 {

552 timerManage();

553

554 *//check if a white disk is at the colour detector*

555 $colour = getButtonPressed(6);

556 **if** ($colour == 1) {

557 *//stop the sorter engine, because its at its highest position*

558 $temp = 10;

559 storeData($temp, 'outputs', HBRIDGE0);

560

561 *//stop the feeder engine*

562 $temp = 0;

563 storeData($temp, 'outputs', FEEDERENGINE);

564 unset($temp);

565

566 *//update state*

567 $state = 10;

568 storeData($state, 'state', 0);

569 unset($state);

570

571 motorUpStop();

572 }

573 unset($colour);

574

575 *//loop*

576 runningStop();

577 }

578

579 *//state 14*

580 **function** motorUpStop()

581 {

582 timerManage();

583

584 *//check if the sorter push button is pressed*

585 $push = getButtonPressed(5);

586 **if** ($push == 1) {

587 *//stop the engine of the sorter*

588 $temp = 0;

589 storeData($temp, 'outputs', HBRIDGE0);

590 unset($temp);

591

592 *//update state*

593 $state = 11;

594 storeData($state, 'state', 0);

595 unset($state);

596

597 whiteWaitStop();

598 }

599 unset($push);

600

601 *//loop*

602 motorUpStop();

603 }

604

605 *//state 15*

606 **function** whiteWaitStop()

607 {

608 **global** $sleep;

609 timerManage();

610

611 *//check if the white disk has been sorted*

612 **if** ($sleep == SORT) {

613 *//it has, so lets start moving the sorter down*

614 $temp = 10;

615 storeData($temp, 'outputs', HBRIDGE1);

616 $temp = 0;

617 storeData($temp, 'outputs', FEEDERENGINE);

618 unset($temp);

619

620 *//update state*

621 $state = 12;

622 storeData($state, 'state', 0);

623 unset($state);

624

625 $sleep = 0;

626 motorDownStop();

627 }

628

629 *//loop*

630 $sleep++;

631 whiteWaitStop();

632 }

633

634 *//state 16*

635 **function** motorDownStop()

636 {

637 **global** $sleep;

638 timerManage();

639

640 *//check if the sorter has moved down*

641 **if** ($sleep == TIMEMOTORDOWN) {

642 *//it has, so lets stop it*

643 $temp = 0;

644 storeData($temp, 'outputs', HBRIDGE1);

645 unset($temp);

646

647 *//update the state*

648 $state = 9;

649 storeData($state, 'state', 0);

650 unset($state);

651

652 $sleep = 0;

653 runningStop();

654 }

655

656 *//loop*

657 $sleep++;

658 motorDownStop();

659 }

660

661 *//not a state*

662 **function** timerInterrupt()

663 {

664 timerManage();

665 *//show that we are in the timer interrupt*

666 $temp = 5;

667 display($temp, 'display');

668

669 *//start moving the sorter up, to start the calibration*

670 $temp = 10;

671 storeData($temp, 'outputs', HBRIDGE0);

672

673 *//stop the rest*

674 $temp = 0;

675 storeData($temp, 'outputs', LENSLAMPPOSITION);

676 storeData($temp, 'outputs', LENSLAMPSORTER);

677 storeData($temp, 'outputs', LEDSTATEINDICATOR);

678 storeData($temp, 'outputs', DISPLAY);

679 storeData($temp, 'outputs', CONVEYORBELT);

680 storeData($temp, 'outputs', FEEDERENGINE);

681

682

683 *//reset, because we will no longer be in timerInterrupt*

684 display($temp, 'display');

685 unset($temp);

686

687 *//go back to initial*

688 $temp = getData('offset', 0);

689 $temp2 = getFuncLocation('initial');

690 $temp += $temp2;

691

692

693 addStackPointer(2);

694 pushStack($temp);

695 addStackPointer(-1);

696 }

697

698 *//not a state*

699 **function** abort()

700 {

701 *//free some memory*

702 unset($engines);

703

704 *//prevent timerinterrupt*

705 setCountdown(1000);

706 $temp = getData('stackPointer', 0);

707 setStackPointer($temp);

708

709 *//stop everything*

710 $temp = 0;

711 storeData($temp, 'outputs', HBRIDGE1);

712 storeData($temp, 'outputs', HBRIDGE0);

713 storeData($temp, 'outputs', LENSLAMPPOSITION);

714 storeData($temp, 'outputs', LENSLAMPSORTER);

715 storeData($temp, 'outputs', LEDSTATEINDICATOR);

716 storeData($temp, 'outputs', DISPLAY);

717 storeData($temp, 'outputs', CONVEYORBELT);

718 storeData($temp, 'outputs', FEEDERENGINE);

719 unset($temp);

720

721 *//apply the changes to actually stop it*

722 timerManage();

723

724 *//update the state*

725 $state = 17;

726 storeData($state, 'state', 0);

727

728

729 *//show we aborted*

730 $state = 7;

731 display($state, 'leds2', 0);

732 unset($state);

733

734 aborted();

735 }

736

737 *//state 17*

738 **function** aborted()

739 {

740 *//prevent timer interrupt*

741 setCountdown(1000);

742 timerManage();

743 *//check if we can start again*

744 $startStop = getButtonPressed(0);

745 **if** ($startStop == 1) {

746 *//start moving the sorter up, to start the calibration*

747 $temp = 10;

748 storeData($temp, 'outputs', HBRIDGE0);

749 unset($temp);

750

751 *//update the state*

752 $state = 0;

753 storeData($state, 'state', 0);

754 unset($state);

755

756 initial();

757 }

758 unset($startStop);

759 aborted();

760

761 }

762

763 *//not a state*

764 **function** timerManage()

765 {

766 **global** $location, $counter, $engine, $sleep;

767

768 **if** ($location == 0) {

769 $engines = 0;

770 }

771

772 *//makes sure that when $counter >12 it will reset to 0*

773 mod(12, $counter);

774

775 *//get the voltage of output $location*

776 $voltage = getData('outputs', $location);

777

778 *//power up the output when it needs to*

779 **if** ($voltage > $counter) {

780 $voltage = $location;

781 $voltage = pow(2, $voltage);

782 $engines += $voltage;

783 }

784

785 *//check if we did all outputs*

786 **if** ($location == 7) {

787 *//actually output the result*

788 sleep(1);

789 display($engines, 'leds');

790

791

792 unset($voltage);

793 *//check if abort is pressed*

794 $abort = getButtonPressed(1);

795 **if** ($abort == 1) {

796 abort();*//STOP THE MACHINE!*

797 }

798 unset($abort);

799

800 *//check if we are in a new iteration*

801 **if** ($counter == 6) {

802 *//set the first part of the display*

803 $temp = getData('state', 0);

804 mod(10, $temp);

805 display($temp, 'display', 1);

806 unset($temp);

807 }

808 *//check if we are at the end of the iteration*

809 **if** ($counter == 11) {

810 *//set the second part of the display;*

811 pushStack($sleep);

812

813 $temp = getData('state', 0);

814 *//get the last digit of the state*

815 *//we have no variables left, so we use $sleep*

816

817 $sleep = $temp;

818 mod(10, $sleep);

819 $temp -= $sleep;

820 $temp /= 10;

821 *//display the last digit*

822 display($temp, 'display', 2);

823

824 pullStack($sleep);

825 unset($temp);

826 }

827

828

829 *//set the variables for the next run*

830 $engines = 0;

831 $location = 0;

832 $counter++;

833

834 *//and return to where we came from*

835 **return**;

836 }

837

838 *//loop*

839 $location++;

840 branch('timerManage');

841 }