**Software integration**

**and integration testing**

**Model: i-DOLPHIN**

**Document No. :**

This document valid from the date of approval

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| **META BIOMED CO., LTD.** |

**Revision History**

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| Date | Revision | Description | Author |
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# Code Review

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| --- | --- | --- | --- | --- |
|  | Software Requirement | Implemented? (Y/N) | Module | Remark |
| CR-M01 | System initialize | Y | Initial process  / Microprocessor | -Create SW components  -Connect to scan process & perform initialization  -Check DB status |
| CR-M02 | Task area switching | Y | Initial process  / Microprocessor | - Scan / Image view / Database task switching |
| CR-M03 | System option setting | Y | Initial process  / Microprocessor | -Save categorized system options to local files |
| CR-M04 | Time & disk status | Y | Initial process  / Microprocessor | -Refresh time & disk information according to predefined interval |
| CR-M05 | Scan status display | Y | Initial process  / Microprocessor | - Display status message and progress information |
| CR-M06 | Scan parameter management | Y | Initial process  / Microprocessor | -Create/delete/ modify parameters  -Import/export parameters  -Check parameter limit & display error message. |
| CR-M07 | Scan protocol management | Y | Initial process  / Microprocessor | -Create/delete/modify protocol information  -Import/export protocol parameters. |
| CR-M08 | Scan operation | Y | Initial process  / Microprocessor | -Scan load / start / stop  -Pre-scan functions  -Display real time |
| CR-M09 | Image reconstruction | Y | Initial process  / Microprocessor | -Independent Image reconstruction  -Support extensible post processing interface |
| CR-M10 | View result images | Y | UI  / Microprocessor | -Support various layout & view mode ( 250 by 250) |
| CR-M11 | Image processing | Y | UI  / Microprocessor | -Support basic tools for image processing (width/level, zoom, flip, inverse, rotation, 2D etc.) |
| CR-M12 | Send images to DB | Y | Initial process  / Microprocessor | -Independent process. -Support queuing function  -Show status. |
| CR-M13 | DB optimization | Y | UI  / Microprocessor | -DB compaction function |
| CR-D01 | HW status checking | Y | Initial process  / Memory Device | - Between hardware and memory status check |
| CR-D02 | Memory DB information | Y | Initial process  / Memory Device | Check the Database status. |
| CR-D03 | Raw data | Y | Initial process  / Memory Device | - First camera data values. |
| CR-D04 | Rom status checking | Y | Initial process  / Memory Device | - ‘bin’ file check |
| CR-D05 | Check initial operation. | Y | Initial process  / Memory Device | - Confirm the initial data values.  - Comparative data confirm the value. |
| CR-E01 | Camera initialize | Y | Initial process  / Energy sources | - Camera focusing  - Camera module initialize |
| CR-E02 | Camera ID / raw data | Y | Initial process  / Energy sources | - Camera ID  - Camera rf data |
| CR-E03 | Fiber Value | Y | Initial process  / Energy sources | - Brightness control (HW) |
| CR-S01 | Overcurrent | Y | Initial process  / Safety features | - Overcurrent protection.  - Equipment protection. |
| CR-S02 | Noise | Y | Initial process  / Safety features | -Minimize noise in the image. |
| CR-X01 | Interface Requirements (PC) | Y | Initial process  / External | - Confirm to the PC connection |
| Interface Requirements (Monitor) | Y | Initial process  / External | - Confirm to the Monitor connection |
| Interface Requirements (Mouse) | Y | Initial process  / External | - Confirm to the Mouse connection |
| Interface Requirements (Key Board) | Y | Initial process  / External | - Confirm to the Key Board connection |
| CR-C01 | Image Save | Y | Initial process  / Communication | * Save image |
| CR-C02 | Image Cine | Y | Initial process  / Communication | * Save Cine |
| CR-C03 | Rotation | Y | Initial process  / Communication | * Degree: 0 / 90 / 180 / 270 * Reverse |
| CR-C04 | Brightness | Y | Initial process  / Communication | * Input brightness value in the UI. |
| CR-C05 | Folder | Y | Initial process  / Communication | * Open the Folder |
| CR-C06 | Folder Check | Y | Initial process  / Communication | * Check if a folder exists. |
| CR-C07 | Zoom | Y | Initial process  / Communication | * Click to enlarge / reduce at UI. |
| CR-C08 | AEC | Y | Initial process  / Communication | * AEC values entered. |
| CR-HW01 | RGGB | Y | Initial process  / Image (H/W) | - Data coming from the camera is an RGGB data. |
| CR-T01 | Memory | Y | Initial process  / Timing | * Check memory usage and speed. (FPS) |
| CR-T02 | System booting | Y | Initial process  / Timing | * System boot time. |
| CR-T03 | Camera recognition time | Y | Initial process  / Timing | * Camera initialization time. |
| CR-SW01 | Bad Pixel Removal | Y | UI / Image Processing | * The more homogeneous the image will look |
| CR-SW02 | Reconstruction | Y | UI / Image Processing | * This color pre-gain algorithm will always be applied. |
| CR-SW03 | Color | Y | UI / Image Processing | * If the Apply option is set to true, the color reconstruction algorithm will be applied |
| CR-SW04 | Color Adjustment Matrix | Y | UI / Image Processing | * This function allows to give a little more saturation to the colors |
| CR-SW05 | Gamma | Y | UI / Image Processing | * This algorithm is applied with a certain gamma correction parameter. |
| CR-SW06 | Frames Mean | Y | UI / Image Processing | * This feature allows to remove some of the image noise |
| CR-SW07 | Skip Frames | Y | UI / Image Processing | * The skip frames is used in slower systems to prevent the high memory usage of the machine, and to assure that we don’t have image delay. |
| CR-SW08 | Brightness | Y | UI / Image Processing | * The brightness value is always applied |
| CR-SW09 | AEC | Y | UI / Image Processing | * This algorithm is AEC |
| CR-SW10 | Show image | Y | UI / Image Processing | * Images displayed on the UI. |

# Module Review

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|  | Software Specifications | | | Implemented? (Y/N) | Remark |
|  | Module | Function | Function related |
| MR-I01 | Initialization | Camera\_ini | Camera\_s  ProcessingWrapper.pr[0]  CtrFiber.value | Y | 카메라에 대한 초기화 및 인식 확인을 한다. |
| MR-I02 | Initialization | Memory\_ini | CSystemOptionsDlg  ::SaveDBDataToFile  ::WriteDataToMIFFile  CRomCheck | Y | 메모리 상태 여부를 확인 한다.  FPGA의 ‘bin’file을 불러와서 실행한다. |
| MR-I03 | Initialization | Timing\_ini | STime\_F  Timefor  Con\_P | Y | Viewbox에 관하여 초기화 및 정상 작동 여부를 확인 한다. |
| MR-I04 | Initialization | Image\_ini | Boot\_S  Con\_S | Y | Image에 관하여 초기화 작업을 한다.  Memory에서 설정된 레지스트 값을 읽어온다.  읽어온 데이터에 관하여 이미지를 획득 하기 시작 한다. |
| MR-I05 | Initialization | ViewBox\_ini | CHwCtrl  FpgaFilesDirectory  CMainSystem  CtrFiber.value | Y | 획득된 이미지를 모니터에 보여주기 위한 작업을 한다. |
| MR-P01 | Processing | Image\_Recon | colorReconstruction  Brightness | Y | 이미지를 재 배열하여 구성한다. |
| MR-P02 | Processing | Image\_Color | colorReconstruction  colorAdjustmentMatrix  videoBox | Y | 이미지의 색상의 밝기, 이득값을 조절한다. |
| MR-P03 | Processing | Image\_improv | RemoveBadPixel  GammaCorrection  framesMean  skipFrames  AEC | Y | 이미지 향상을 위하여 사용한다.  좋지 못한 값을 필터를 통하여 제거 하고, 프래임을 줄이는 반면, 보다 좋은 계산을 할 수 있도록 한다.  또한 AEC를 통하여 보다 좋은 이미지를 제공한다. |
| MR-U01 | Interface | SImage  SCine | SaveDir  SaveImg  SaveCine | Y | 이미지 저장 및 동영상을 저장한다. |
| MR-U02 | Interface | RArrange | RRotation  Zoomin | Y | 이미지 회전 및 축소/확대를 한다. |
| MR-U03 | Interface | InValue | RBright  AEC.greyvalue | Y | 밝기 값을 조절 및 AEC값을 조절한다. |
| MR-E01 | External | UseSystem | Using System  System.IO | Y | 외부 시스템과 연동에 관한 알고리즘을 실행 한다. |

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# Integration Review

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| --- | --- | --- | --- | --- | --- |
|  | Software Specifications | | | Implemented? (Y/N) | Remark |
|  | Status | Function | Module |
| IR-01 | Initialization | SysInitialization | Camera\_ini  Memory\_ini  Timing\_ini  Image\_ini  Image\_ini  ViewBox\_ini | Y | 전체적인 시스템 초기화  - 카메라 연결 및 viewbox 연결 확인  - Timing에 맞춰서 장비가 작동이 되는지 확인  - 레지스터값에 맞춰서 이미지 초기화 셋팅  - 메모리 확인  만약 오류시 오류 메시지 표시 및 사용자에게 알려 준다. |
| IR-02 | Processing | ImagingProcessing | Image\_Recon  Image\_Color  Image\_improv | Y | 이미지개선을 위한 프로세싱  - 이미지 재구성  - RGGB값의 이득값을 각각 제공 |
| IR-03 | Interface | UserInterface | SImage  SCine  RArrange  InValue | Y | 사용자가 UI에서 직접 컨트롤  - 이미지 저장 및 동영상 저장, 이미지는 jpeg로 저장. 동영상은 avi로 저장  - 이미지 재구성  - AEC 값 입력 |
| IR-04 | External | ExternalDev | UseSystem | Y | 외부 디바이스와 연결. |