

| Iteration | Purpose                                                                                                    | Defined    | Due        | Delivered  | Version | Notes                |
|-----------|------------------------------------------------------------------------------------------------------------|------------|------------|------------|---------|----------------------|
| 1         | Initial with basic infrastructure                                                                          | 19/02/2010 | 12/03/2010 | 12/03/2010 | 1.00    |                      |
| 2         | File I/O and data structures                                                                               | 12/03/2010 | 01/04/2010 | 06/04/2010 | 1.01    |                      |
| 3         | AYB Initialisation                                                                                         | 08/04/2010 | 26/04/2010 | 27/04/2010 | 1.02    |                      |
| 4         | Base Call Loop                                                                                             | 06/05/2010 | 21/05/2010 | 20/05/2010 | 1.03    |                      |
| 5         | MPN, quality output, datablock                                                                             | 28/05/2010 | 17/06/2010 | 17/06/2010 | 1.04    |                      |
| 6         | P Solver, MPN unit test, cif format                                                                        | 22/06/2010 | 29/07/2010 | 30/07/2010 | 1.05    |                      |
|           | Pause for testing and experimentation                                                                      |            |            |            |         |                      |
| 7         | Final working values, mu arg, bad data handling                                                            | 25/08/2010 | 21/09/2010 | 22/09/2010 | 1.06    |                      |
| 8         | Quality score calibration, missing data handling, GC content, sim output, argument defaults, optimisation. | 01/11/2010 | 12/11/2010 | 15/11/2010 | 1.07    |                      |
| 9         | Additional final MPN output, documenting, tidy up.                                                         | 15/11/2010 | 06/12/2010 | 07/12/2010 | 2.00    | First public release |
| 10        | Quality calibration file and cif run-folder.                                                               | 13/12/2010 | 21/01/2011 | 21/01/2011 | 2.01    |                      |
| 11        | Quality calibration file now values to use.                                                                | 01/02/2011 | 17/02/2011 | 17/02/2011 | 2.02    |                      |
| 12        | Model refactor and automated testing.                                                                      | 22/02/2011 | 17/03/2011 | 10/05/2011 | 2.03    | Delayed until needed |

| Index | Priority | Task                                                     | Planned | Actual | Notes                                                                |
|-------|----------|----------------------------------------------------------|---------|--------|----------------------------------------------------------------------|
| 1     |          | Initial system: Make; Run                                | 1       | 1      |                                                                      |
| 2     |          | Program Version                                          | 1       | 1      |                                                                      |
| 3     |          | Program arguments: Read and store: Infrastructure        | 1       | 1      |                                                                      |
| 4     |          | Program Log: Infrastructure                              | 1       | 1      |                                                                      |
| 5     |          | Signal Handler                                           | 1       | 1      |                                                                      |
| 6     |          | File I/O: Locate, open/create, read/write, close         | 2       | 2      | Requires args input (i), output (o);                                 |
| 7     |          | Data Structures: Tile, Cluster, Matrix                   | 2       | 2      |                                                                      |
| 8     |          | Intensities Input: Locate, read, store, tidy up          | 2       | 2      |                                                                      |
| 9     |          | Matrix Input: Locate, read, store, tidy up; Read M, N, P | 2       | 3      | Requires args M (M), N (N), P (P)                                    |
| 10    |          | Processed Intensities: Calculate and store, tidy up      | 3       | 3      |                                                                      |
| 11    |          | Initial Sequence: By maximum intensity                   | 3       | 3      |                                                                      |
| 12    |          | Sequence output: Create file, write data, close          | 3       | 3      |                                                                      |
| 13    |          | Replace message macros with vfprintf                     | 2       | 2      |                                                                      |
| 14    |          | Expand message severity list to include debug            | 2       | 2      |                                                                      |
| 15    |          | Configure Doxygen; add comments to new HM files          | 2       | 2      |                                                                      |
| 16    |          | Matrix: Add read_methods for multiple styles             | 3       | 3      | 1) Intensities 2) As rows of columns. Move matrix read from cluster. |
| 17    |          | Initial Lambda: Ignore weights                           | 3       | 3      |                                                                      |

|    |                                                                                |   |   |                                                                                  |
|----|--------------------------------------------------------------------------------|---|---|----------------------------------------------------------------------------------|
| 18 | Calculate Covariance                                                           | 4 | 4 |                                                                                  |
| 19 | Estimate Lambda                                                                | 4 | 4 |                                                                                  |
| 20 | Call Bases                                                                     | 4 | 4 |                                                                                  |
| 21 | Base Call Loop                                                                 | 4 | 4 | Requires args niter (n?); change ncycles to c?                                   |
| 22 | Utility: Reimplement xfree null return                                         | 4 | 4 | Use ** or return, could apply to all free_* functions                            |
| 23 | XIO: Check and amend file structure handling; nulls etc.; null return on close | 4 | 4 | Make interface as close to normal file handle as possible                        |
| 24 | XIO: rename initialise_aybstd to not contain 'ayb'                             | 4 | 4 |                                                                                  |
| 25 | I/O: If input file open fails then warn and carry on                           | 4 | 4 | But stop if output fails as all will                                             |
| 26 | I/O: Output files should not be compressed                                     | 4 | 4 | Test: compressed input, input with no extension, input with no delimiter, combo? |
| 27 | I/O: Create output directories if do not exist                                 | 4 | 4 | Include log; abort if create fails.                                              |
| 28 | I/O: Intensities: Expand fixed match to “_int.txt”                             | 4 | 4 | As original                                                                      |
| 29 | Program log: Replace fixed “ayb” with prefix                                   | 4 | 4 | hhmm not sufficient for parallel runs                                            |
| 30 | Program log: Add initial information line                                      | 4 | 4 | Program name, date/time                                                          |
| 31 | Program log: switch order of warning and information                           | 4 | 4 |                                                                                  |

|    |                                                                                                               |   |   |                                                                                                                                                                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32 | Process Intensities file for analysis by block                                                                | 5 | 5 | New argument blockstring (b) of the form: RnInCn, decoded as:<br>R=>read<br>I=>ignore<br>C=>concatenate to previous block<br>Note no difference in analysis for forward and backward data. Then:<br>less data than specified=>abort program;<br>more data than specified=>warn and continue |
| 33 | Implement Quality Scores                                                                                      | 5 | 5 | Actually 2 alternative outputs fasta/fastq. Requires arg format (f).                                                                                                                                                                                                                        |
| 34 | Implement MPN estimation.                                                                                     | 5 | 5 | Get from AYBc; convert intensities access from single array to via cluster list. Use MPN initialisation as in AYBc                                                                                                                                                                          |
| 35 | Allow selection of routines to solve for P. Remove simultaneous solve for P and N (from TM)                   | 6 | 6 | Alternatives are: Standard SVD; Standard SVD then zero negative entries; Non-negative least squares.                                                                                                                                                                                        |
| 36 | Unit test of MPN estimation.                                                                                  | 6 | 6 | Already exists in an old form but requires changes; coercing values into array/cluster/tile; other bits.                                                                                                                                                                                    |
| 37 | Option to read Intensity data in cif format.                                                                  | 6 | 6 | Get from AYBc; convert intensities access from single array to via cluster list. Requires arg dataformat (d).                                                                                                                                                                               |
| 38 | Optional output of final processed intensities, M, P, N, lambda, weights                                      | 7 | 7 | Final processed format as intensities input, illumina or cif. Write cif format already exists. One file per input with tag "pif". Single file (tag "final") used for all other values in show_MAT format. Requires arg working (w)                                                          |
| 39 | mu should be a parameter as in AYBc.                                                                          | 7 | 7 | Requires arg mu (m)                                                                                                                                                                                                                                                                         |
| 40 | Introduce a diagonal delta to the solver routines (ridge regression); avoids failure to solve when data bad . | 7 | 7 | Use value 1 which is small compared with typical matrix values.                                                                                                                                                                                                                             |
| 41 | Count zero lambdas for each file and output at end if any.                                                    | 7 | 7 | Output per iteration.                                                                                                                                                                                                                                                                       |
| 42 | Stop and issue message if data error detected.                                                                | 7 | 7 | Initially failure to calculate covariance.                                                                                                                                                                                                                                                  |
| 43 | Remove padding zeros from output cluster line.                                                                | 7 | 7 | There are typically > 10,000 clusters but could be any number.                                                                                                                                                                                                                              |
| 44 | Couple of bugs in string length allocation.                                                                   | 7 | 7 | Cause segment errors.                                                                                                                                                                                                                                                                       |

|    |                                                                                                                                                                                                                                               |   |   |                                                                                                                                                                                                                                                                                                                              |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 45 | Make double calculations standard.                                                                                                                                                                                                            | 7 | 7 | Accuracy of float not sufficient for larger values.                                                                                                                                                                                                                                                                          |
| 46 | Calibration of quality score.                                                                                                                                                                                                                 | 8 | 8 | Adjust in line with empirical observations using a table and neighbouring scores.                                                                                                                                                                                                                                            |
| 47 | Deal with missing data by setting base call to ambiguous.                                                                                                                                                                                     | 8 | 8 | Defined as all intensities zero.                                                                                                                                                                                                                                                                                             |
| 48 | Additional deltas; use for M solve and add for covariance.                                                                                                                                                                                    | 8 | 8 |                                                                                                                                                                                                                                                                                                                              |
| 49 | Option to penalise base calls by genomic CG content.                                                                                                                                                                                          | 8 | 8 | Requires arg composition (c); values $0 < gc < 1$ .                                                                                                                                                                                                                                                                          |
| 50 | Tidy compiler warnings from fortran and array.def.                                                                                                                                                                                            | 8 | 8 |                                                                                                                                                                                                                                                                                                                              |
| 51 | Optional output of full covariance matrix and lambda fit.                                                                                                                                                                                     | 8 | 8 | For multiple blocks use lambdas from first block only and append additional block covariance. Print header text, program version and command line, substituting for header text as already printed, then num cycles and fit params. All lines to begin with hash; locate any newlines and add hash. Requires arg simdata (s) |
| 52 | Final processed output does not allow for multiple blocks.                                                                                                                                                                                    | 8 | 8 |                                                                                                                                                                                                                                                                                                                              |
| 53 | Changes to arguments: default dataformat to cif, format to fastq, solver to zero. New blockstring default all available cycles in one block. Replace prefix with any number of non-option arguments, also allowing inclusion of partial path. | 8 | 8 | Requires additional input file search loop. Use of prefix has caused problems when e.g. file and file_end1 both exists.<br>Make default prefix behaviour an exact match with a '+' as last character indicating treat as prefix.<br>Message file must now be supplied as path and filename.                                  |
|    | Flush error file after each message to capture info in case of failure.                                                                                                                                                                       | 8 | 8 | with 53                                                                                                                                                                                                                                                                                                                      |
|    | Change message to use CSTRING instead of fixed length                                                                                                                                                                                         | 8 | 8 | with 53                                                                                                                                                                                                                                                                                                                      |
| 54 | Ensure an info message for all options that affect results.                                                                                                                                                                                   | 8 | 8 | Need GC comp and Mu; ignore message file. No genome composition if default.                                                                                                                                                                                                                                                  |
| 55 | Optimisation                                                                                                                                                                                                                                  | 8 | 8 | Improve runtime.                                                                                                                                                                                                                                                                                                             |

|    |                                                                                              |    |    |                                                                                                                                                                                                                                                                                                                                                                                                               |
|----|----------------------------------------------------------------------------------------------|----|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 56 | Tidy compiler warnings from intel C compiler.                                                | 8  | 8  | strcasecmp in strings, mode_t in sys/types, BSD_SOURCE for scandir, cast int to enum, goto jumps over variable declarations, multiple const                                                                                                                                                                                                                                                                   |
| 57 | Additional output of M, P and N matrices.                                                    | 9  | 9  | With final processed, in correct format for input.                                                                                                                                                                                                                                                                                                                                                            |
| 58 | Does not seem to respond to ctrl<c>                                                          | 9  | 9  |                                                                                                                                                                                                                                                                                                                                                                                                               |
| 59 | Use actual executable name in final message.                                                 | 9  | 9  |                                                                                                                                                                                                                                                                                                                                                                                                               |
| 60 | Phasing estimation bug.                                                                      | 9  | 9  |                                                                                                                                                                                                                                                                                                                                                                                                               |
| 61 | Fix warnings from static analyser.                                                           | 9  | 9  |                                                                                                                                                                                                                                                                                                                                                                                                               |
| 62 | Expand and improve documentation.                                                            | 9  | 9  | Expand top level doxygen page; create manual page/user guide; improve and tidy up some module and code documentation.                                                                                                                                                                                                                                                                                         |
| 63 | Go to next prefix if input matrix is the wrong size.                                         | 9  | 9  | Assume co-located intensities files with common prefix have same number of cycles.                                                                                                                                                                                                                                                                                                                            |
| 64 | Fix remaining compiler warnings.                                                             | 9  | 9  | xio discards qualifiers.                                                                                                                                                                                                                                                                                                                                                                                      |
| 65 | Create README with build instructions and outline CHANGELOG.                                 | 9  | 9  | Use AsciiDoc format so suitable for web and download.                                                                                                                                                                                                                                                                                                                                                         |
| 66 | Read in quality calibration file. Use as conversion to default and optionally output result. | 10 | 10 | Format is column file with multiple matrices per file; includes comment lines and trailing comments (#). Requires arg qualtab (Q).<br>Requires arg runfolder (r) (no argument), run-folder given in input option. Prefix replaced by lanetile string Ln[-n]Tn[-n] to process a range of lanes and tiles. Error if cif not selected. Output to s_L_TTTT. Note: single cycle fails with tmp memory error (MNP). |
| 67 | Read cif files directly from a run-folder.                                                   | 10 | 10 |                                                                                                                                                                                                                                                                                                                                                                                                               |
| 68 | Allow prefix or input filepath to contain complete path.                                     | 10 | 10 |                                                                                                                                                                                                                                                                                                                                                                                                               |

|     |                                                                                                                                |    |    |                                                                                                                                                                                                                                                       |
|-----|--------------------------------------------------------------------------------------------------------------------------------|----|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 69  | Make quality calibration file values to use instead of conversion for default. Need to co-ordinate release with new ayb_recal. | 11 | 11 | Need to output used values by default for use by ayb_recal, turn off with argument noqualout (q). One per run with filename logname.tab or ayb_XXXXXX_yymmdd_hhmm. Use header at top of table to act as history, separated from rest by a blank line. |
| 70  | Add success/failure message at end of log as well as to stdout.                                                                | 11 | 11 | with item 69                                                                                                                                                                                                                                          |
| 71  | Split ayb_model which has become very large.                                                                                   | 12 | 12 | Extract bulk of AYB structure access to new ayb. Make pointer to AYB structure public but keep internals hidden.                                                                                                                                      |
| 72  | Automate module testing with a test script.                                                                                    | 12 | 12 | Create reference results for future comparison. Enhancements to cluster/tile/nuc; expand message, xio to all; test all functions including null values and other bad input.                                                                           |
| 73  | Automate system testing with a test script.                                                                                    | 12 | 12 | Create reference results for future comparison. Test normal run modes but not failure modes (done at module level). Test program options in principle.                                                                                                |
|     | Tidy function headers for doxygen.                                                                                             |    |    | Weibull                                                                                                                                                                                                                                               |
|     | Dirio and message program output not documented in header.                                                                     |    |    | Do with next change.                                                                                                                                                                                                                                  |
|     | Automated module testing continued. Plan: datablock, dirio, weibull?                                                           |    |    | Others to improve: matrix, mpn, Others new: ayb_options, cif, datablock, dirio, qual_table, utility, more? weibull?                                                                                                                                   |
| New | Method of filtering the list of clusters according to some criteria; resultant finds should be marked (separately)             |    |    | Possible filters:<br>- cycle in cluster with all signals zero (signals missing)<br>- cycle in cluster with signal greater than some threshold (argument)                                                                                              |

|                                                                                    |                                                                                                                                                                                     |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                    | The filter_list, filtercopy_list and split_list functions do this but may need to be modified to retain the same ordering of elements (cf read_TILE and read_known_TILE).           |
| Additional for developer guide.                                                    | Overview, program flow, file formats (incl quality conversion), release instructions, glossary. Full stops at end of lists. Also how to generate in readme. Handling of array/list. |
| Additional somewhere                                                               | Input file formats: matrix, quality table.                                                                                                                                          |
| Investigate doxygen extension mapping warning.                                     | Also expansion of macros; MACRO_EXPANSION=; def->h?                                                                                                                                 |
| Web based bug tracking facility.                                                   |                                                                                                                                                                                     |
| Continue to look at efficiency.                                                    |                                                                                                                                                                                     |
| Errors                                                                             |                                                                                                                                                                                     |
| In Matrix, test instructions are wrong way round                                   |                                                                                                                                                                                     |
| Functions that take no arguments should include void inside the argument brackets. | Deal with as seen; handler checksignals.                                                                                                                                            |
| Doxy changes                                                                       | Deal with as seen; model WORKPTR, datablock DATABLOCK                                                                                                                               |
| Consider                                                                           |                                                                                                                                                                                     |
| Check all algorithms use preferred versions.                                       | e.g. calculate lambda.                                                                                                                                                              |



AYB struct: Make bases and quals part of cluster, also lambda and weights?

But will make tile bigger with empty space? weights are accessed as an array for mean/var purpose; also use of set/scale\_MAT.

Parameters to makefile to allow debug/double?

## Refactor

Move base penalty to call\_base.

Where it is used.

Rationalise use of int/long/uint32 types

Be aware of efficiency issues.

Optionally use message in matrix/cluster/tile/nuc/more? controlled by compiler switch.

Set switch flag in message?

New message functionality to return message string

For use with perror, length of string? vsnprintf? Maybe return pointer to string stored and freed in message.

Message: use a different word than type for msgtype?

Confusing in documentation

Add segmentation violation handler

Tidy up order of some items, e.g. ayb\_model set..., list of options.

Make --version option comply to GNU coding standards

## Note

matrix not yet documented

| Index | Note                                                            | Resolution |
|-------|-----------------------------------------------------------------|------------|
| 1     | Divide by zero does not cause FPE so not tested                 |            |
| 2     | Have not resolved all the get memory issues during data append. |            |

| Index | Task                                         | Additional Requirements                                                                                                                                                     | Completed  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 71    | Split ayb_model which has become very large. | Extract bulk of AYB structure access to new ayb. Make pointer to AYB structure public but keep internals hidden.                                                            | 22/03/2011 | See AYB model split plan below. Model keeps setup, read intensities, looping structure and output (except final). AYB structure pointer no longer global but passed as parameter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 72    | Automate module testing with a test script.  | Create reference results for future comparison. Enhancements to cluster/tile/nuc; expand message, xio to all; test all functions including null values and other bad input. | 16/03/2011 | Cif readCIFfromStream check for null fp and read file failure. Cluster show increase maximum matrix columns to 10; read_first_cluster, all cycles, write_coordinates, optional cif input file testing. Message expand to test all functions; in message lists add dummy enums between different param requirements and use to bulk test. Nuc nucs_from_string, quality range, quality from prob, optional read_nuc/phred testing. Tile read_folder_tile check for null root and store lane tile; all cycles, write_lane_tile, copy_tile, optional cif input file and folder testing. Xio expand to test all functions; xfgettok check for null separator; include bad parameter and bad input testing; corrections made: add extra checks for null parameters; xfgets returns null if fails; xfgettok zero len returned if bad parameter; correct return type from zip read/write; use fputs not xfputs (under test) for test result output. New AYB_module_test.sh, standard inputs and outputs. |
| 73    | Automate system testing with a test script.  | Create reference results for future comparison. Test normal run modes but not failure modes (done at module level). Test program options in principle.                      | 06/04/2011 | New AYB_system_test.sh, standard inputs and outputs in a suite of directories.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|       |                                              |                                                                                                                                                                             |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|       |                                              |                                                                                                                                                                             |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Ayb\_model split plan**

AYB structure referenced in:

| <b>function</b>        | <b>called by</b>                              | <b>uses</b>                                    | <b>destination</b> | <b>new structure access functions</b> |
|------------------------|-----------------------------------------------|------------------------------------------------|--------------------|---------------------------------------|
| initialise_model       | analyse_tile                                  | All                                            | ayb (public)       |                                       |
| update_cluster_weights | estimate_MPN                                  | All                                            | ayb                |                                       |
| estimate_MPN           | analyse_tile                                  | All                                            | ayb (public)       |                                       |
| calculate_covariance   | estimate_bases, output_simdata                | All                                            | ayb (public)       |                                       |
| open_processed         | estimate_bases                                | ncycle,<br>ncluster                            | ayb                |                                       |
| write_processed        | estimate_bases                                | ncycle, tile                                   | ayb                |                                       |
| output_final           | close_processed                               | whole, M, N, P                                 | ayb                |                                       |
| close_processed        | estimate_bases                                | whole                                          | ayb                |                                       |
| estimate_bases         | analyse_tile                                  | All                                            | ayb (public)       |                                       |
| output_results         | analyse_tile                                  | whole,<br>ncluster,<br>ncycle, bases,<br>quals | model              | get_ncluster, show_bases, show_quals  |
| output_simdata         | analyse_tile                                  | lambda, ncycle                                 | model              | get_ncycle, get_lambdas (nonzero)     |
| <i>public</i>          | -----                                         | -----                                          | -----              | -----                                 |
| new_AYB                | analyse_tile                                  | All                                            | ayb                |                                       |
| free_AYB               | analyse_tile                                  | All                                            | ayb                |                                       |
| copy_AYB               | -                                             | All                                            | ayb                |                                       |
| show_AYB               | analyse_tile,<br>estimate_bases, output_final | All                                            | ayb                |                                       |
| analyse_tile           | ayb_main                                      | whole, tile,<br>ncycle                         | model              | get_ncycle, replace_tile              |

AYB structure not used in:

| <b>function</b> | <b>called by</b> | <b>destination</b> | <b>need</b> |
|-----------------|------------------|--------------------|-------------|
|-----------------|------------------|--------------------|-------------|

|                           |                                  |       |                     |
|---------------------------|----------------------------------|-------|---------------------|
| read_matrices             | startup                          | ayb   | call to ayb_startup |
| create_datablocks         | analyse_tile                     | model |                     |
| init_matrix               | initialise_model                 | ayb   |                     |
| nodata                    | initialise_model, estimate_bases | ayb   |                     |
| accumulate_all_covariance | calculate_covariance             | ayb   |                     |
| accumulate_covariance     | calculate_covariance             | ayb   |                     |
| output_zero_lambdas       | analyse_tile                     | model |                     |
| has_whitespace            | output_simdata                   | model |                     |
| format_header             | output_simdata                   | model |                     |
| <i>public</i>             | -----                            | ----- | -----               |
| read_intensities_file     | ayb_main                         | model |                     |
| read_intensities_folder   | ayb_main                         | model |                     |
| startup_model             | ayb_main                         | model |                     |
| tidyup_model              | ayb_main                         | model |                     |

| <b>option function</b> | <b>used in</b>                             | <b>sets</b>                   | <b>destination</b> | <b>need</b>      |
|------------------------|--------------------------------------------|-------------------------------|--------------------|------------------|
| set_composition        | startup, estimate_bases                    | BasePenalty                   | ayb                | log message also |
| set_niter              | startup, analyse_tile, output_zero_lambdas | NIter                         | model              |                  |
| set_output_format      | startup, output_results                    | OutputFormat                  | model              |                  |
| set_show_working       | estimate_bases                             | ShowWorking                   | ayb                |                  |
| set_simdata            | analyse_tile, output_simdata, tidyup       | SimData,<br>SimText           | model              |                  |
| set_solver             | startup, estimate_MPN                      | SolverIndex,<br>SolverRoutine | ayb                | log message also |

Move to ayb\_startup:

some log messages  
read\_matrices  
read\_quality\_table

Constants and members moved as required.

| Index | Task                                                                                                                           | Additional Requirements                                                                                                                                                                                                                               | Completed  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 69    | Make quality calibration file values to use instead of conversion for default. Need to co-ordinate release with new ayb_recal. | Need to output used values by default for use by ayb_recal, turn off with argument noqualout (q). One per run with filename logname.tab or ayb_XXXXXX_YYMMDD_HHMM. Use header at top of table to act as history, separated from rest by a blank line. | 10/02/2011 | <p>New qual_table contains quality table object with structure shared with ayb_recal (same filename); read in, output and adjust_quality (from call_bases); home of qualout flag; default table stored in new calibration where header contains just external Qtable pointer and source generated by ayb_recal.</p> <p>Xio new xfgettok read until separator; xfgetln use with separator \n; return null instead of empty string if nothing read, requires null checks in cluster; new test-xio, also include in Makefile.</p> <p>Message new generate_name creates virtual filename using dev/urandom; call from startup_message if not specified; new get_message_path; new test-message, also include in Makefile.</p> <p>Dirio new open_run_output makes new output filepath from log file and opens; uses new name_only and renamed output_name_suffix.</p> <p>Call_bases all quality table moved to qual_table, affects ayb_model.</p> <p>Ayb_main call output_quality_table, tidyup_qual_table</p> <p>Ayb_options opt simdata moved to first in longopts list to avoid having to continually change simdata index.</p> |
| 70    | Add success/failure message at end of log as well as to stdout.                                                                | with item 69                                                                                                                                                                                                                                          | 10/02/2011 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|       |                                                                                                                                |                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| Index | Task                                                                                         | Additional Requirements                                                                                                                                                                                                                                                 | Completed  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 66    | Read in quality calibration file. Use as conversion to default and optionally output result. | Format is column file with multiple matrices per file; includes comment lines and trailing comments (#). Requires arg qualtab (Q).                                                                                                                                      | 17/12/2010 | Matrix read_column_file already ignores anything trailing after sufficient column values but check each value for valid numeric; skip comment lines using new getnextline; write_column_file optional free format outputs values with default decimal places.<br>Dirio store filepath in same array as MNP, need new end MNP in enum;<br>Call_bases new read_quality_table (using 3 new subproc); output if msg level debug; call from startup_model.<br>Message new get message level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 67    | Read cif files directly from a run-folder.                                                   | Requires arg runfolder (r) (no argument), run-folder given in input option. Prefix replaced by lanetile string Ln[-n]Tn[-n] to process a range of lanes and tiles. Error if cif not selected. Output to s_L_TTTT. Note: single cycle fails with tmp memory error (MNP). | 20/01/2011 | Tile new read_folder_TILE; move common cif to tile to new create_TILE_from_cif.<br>Dirio new int pair type for lane/tile; new globals for min, max and current; runfolder flag set by option; new check_dir checks a dir exists, extracted from check_outdir; replace get_pattern (no longer used) with get_input_path; new set_lanetile (and 3 new subproc) decodes lanetile string and stores, call from set_pattern if runfolder; new get_next_lanetile returns next lane/tile and sets current filename; also lanetile_isnull; in startup check input dir exists and if runfolder check cif selected.<br>Datablock use message log.<br>Cif errors: crash on large values found in cif_set_from_real switch; use new round_and_clip; file not closed in cif_add_file; also pass cluster/cycle to showCIF.<br>Ayb_model make read_intensities_file global and new read_intensities_folder; store result in new global MainTile and move error checks to analyse_tile, removing read_intensities call; check at least 2 cycles.<br>Ayb_main if runfolder call get_next_lane_tile instead of open_next; call read_intensities_file/folder before analyse_tile. |
| 68    | Allow prefix or input filepath to contain complete path.                                     | May be more intuitive.                                                                                                                                                                                                                                                  | 07/01/2011 | Dirio full_path and move_path (was move_partial_path) check filename for root dir and use alone if found.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Index | Task                                                         | Additional Requirements                                                                                               | Completed  | Notes                                                                                                                                                                                                                         |
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| 57    | Additional output of M, P and N matrices.                    | With final processed, in correct format for input.                                                                    | 16/11/2010 | New matrix write_MAT_to_column_file. Ayb_model new output_final.                                                                                                                                                              |
| 58    | Does not seem to respond to ctrl<c>                          |                                                                                                                       | 16/11/2010 | No tidyup required so just remove handler install from main.                                                                                                                                                                  |
| 59    | Use actual executable name in final message.                 | Useful for comparisons.                                                                                               | 16/11/2010 | ayb_main from argv[0]. Also make path delimiter a common constant in dirio (also used in message).                                                                                                                            |
| 60    | Phasing estimation bug.                                      |                                                                                                                       | 23/11/2010 | ayb_model and mpn calculatePrhs.                                                                                                                                                                                              |
| 61    | Fix warnings from static analyser.                           |                                                                                                                       | 26/11/2010 | Ayb_model unused return values, initialise_model, calc_covariance, estimate_bases cleanup; Cluster, dirio unused return values. Mpn default mode value. Utility incorrect extend_cstring, change to renew. Xio unused strlen. |
| 62    | Expand and improve documentation.                            | Expand top level doxygen page; create manual page/user guide; improve and tidy up some module and code documentation. | 07/12/2010 | mainpage, Doxyfile (also remove usefloat); new AYB.1.txt in AsciiDoc format, generates user and man page; Makefile generate user/man with archive; ayb_help, ayb_usage, datablock, dirio, message (also move fflush).         |
| 63    | Go to next prefix if input matrix is the wrong size.         | Assume co-located intensities files with common prefix have same number of cycles.                                    | 01/12/2010 | Status fail on ayb_model false return from initialise_model.                                                                                                                                                                  |
| 64    | Fix remaining compiler warnings.                             | xio discards qualifiers.                                                                                              | 02/12/2010 | Use a cast to remove.                                                                                                                                                                                                         |
| 65    | Create README with build instructions and outline CHANGELOG. | Use AsciiDoc format so suitable for web and download.                                                                 | 07/12/2010 |                                                                                                                                                                                                                               |



| Index | Task                                                       | Additional Requirements                                                                                                                                                                                                                                                                                                      | Completed  | Notes                                                                                                                                                                                                                                                                                                                                                                                 |
|-------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46    | Calibration of quality score.                              | Adjust in line with empirical observations using a table and neighbouring scores.                                                                                                                                                                                                                                            | 12/10/2010 | Call base returns quality value not phred char; new adjust quality called from ayb_model after all bases called and before convert to phred; first and last require special handling; include new calibration files. New nuc routines to split prob to phred and MIN_QUALITY.                                                                                                         |
| 47    | Deal with missing data by setting base call to ambiguous.  | Defined as all intensities zero.                                                                                                                                                                                                                                                                                             | 12/10/2010 | Nuc ambig is beyond nbase array range; new nuc isambig called wherever base index referenced. New call_base_nodata; add handling to quality adjust. In ayb_model check for no data before call base.                                                                                                                                                                                  |
| 48    | Additional deltas; use for M solve and add for covariance. |                                                                                                                                                                                                                                                                                                                              | 12/10/2010 |                                                                                                                                                                                                                                                                                                                                                                                       |
| 49    | Option to penalise base calls by genomic CG content.       | Requires arg composition (c); values $0 < gc < 1$ .                                                                                                                                                                                                                                                                          | 12/10/2010 | Penalty calculated for each base and stored as arrayx4. Pass to call base and use to adjust calculation.                                                                                                                                                                                                                                                                              |
| 50    | Tidy compiler warnings from fortran and array.def.         |                                                                                                                                                                                                                                                                                                                              | 12/10/2010 | Array use attribute used.                                                                                                                                                                                                                                                                                                                                                             |
| 51    | Optional output of full covariance matrix and lambda fit.  | For multiple blocks use lambdas from first block only and append additional block covariance. Print header text, program version and command line, substituting for header text as already printed, then num cycles and fit params. All lines to begin with hash; locate any newlines and add hash. Requires arg simdata (s) | 22/10/2010 | Dirio open append option. Matrix show_MAT with optional rownum. Ayb_options match string to an option. Version now in new ayb_version.c so version can be exported to more than one file.<br>Ayb_model store flag and header text; accumulate_all_covariance; output_simdata calculates values and writes after formatting header lines; analyse_tile needs arg params from ayb_main. |
| 52    | Final processed output does not allow for multiple blocks. |                                                                                                                                                                                                                                                                                                                              | 22/10/2010 | ayb_model pass blk -> estimate_bases -> open_processed; use to open pif and final.                                                                                                                                                                                                                                                                                                    |

|     |                                                                                                  |                                                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 53a | Changes to arguments: default dataformat to cif, format to fastq, solver to zero.                |                                                                                                                                                                                                                                                                                       | 27/10/2010 | dataformat - dirio change default; ayb_model remove duplicate InputFormat - get when needed; info message moved to dirio (improve order).<br>output format - ayb_model change default.<br>solver - ayb_model change default; store solver index and output info message; make selection info message generic. Update help defaults.                                                                                                                                                                                                                                                                                                              |
| 53b | New blockstring default all available cycles in one block.                                       |                                                                                                                                                                                                                                                                                       | 28/10/2010 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 53c | Replace prefix with any number of non-option arguments, also allowing inclusion of partial path. | Requires additional input file search loop. Use of prefix has caused problems when e.g. file and file_end1 both exists. Make default prefix behaviour an exact match with a '+' as last character indicating treat as prefix. Message file must now be supplied as path and filename. | 09/11/2010 | Dirio move pattern check/scandir to set_pattern; new clear_pattern; new pattern path, filled by new move_partial_path, to hold input path and partial path; in match_pattern treat as prefix only if prefix indicator. Read_options return next arg index; options/help/usage make alphabetical. Move reopt enum to utility and use as analyse_tile return to indicate stop/next pattern; propagate in ayb_model as required. Ayb_main new outer loop through non-option args calling set_pattern. Message path is now full pathname not location and no default; create_filename replaced by check_message_path; some fatal messages now error. |
| 54  | Ensure an info message for all options that affect results.                                      | Need GC comp and Mu; ignore message file. No genome composition if default.                                                                                                                                                                                                           | 02/11/2010 | Ayb_model output from model startup; mu needs export from call_bases.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 55  | Optimisation                                                                                     | Improve runtime.                                                                                                                                                                                                                                                                      | 11/11/2010 | Nuc new has_ambiguous_base used as precheck where isambig is called in tight loop; replace int/uint_32 with uint_fast32 in compute heavy loops; precalculate weight matrix; affects intensities process/expected_intensities, mpn calculateJ/K. Makefile add unroll-loops optimiser.                                                                                                                                                                                                                                                                                                                                                             |
| 56  | Tidy compiler warnings from intel C compiler.                                                    | strcasecmp in strings, mode_t in sys/types, BSD_SOURCE for scandir, cast int to enum, goto jumps over variable declarations, multiple const                                                                                                                                           | 12/11/2010 | ayb_main, ayb_model, cif, cluster, dirio, tile, utility, Makefile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Index | Task                                                                                                          | Additional Requirements                                                                                                                                                                                                            | Completed  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 38    | Optional output of final processed intensities, M, P, N, lambda, weights                                      | Final processed format as intensities input, illumina or cif. Write cif format already exists. One file per input with tag "pif". Single file (tag "final") used for all other values in show_MAT format. Requires arg working (w) | 20/09/2010 | Matrix write_to_line; Cluster write_coords; new read_first to get lane & tile, common read parts to subproc; Tile write_lane_tile, use cluster read_first. Cif set_from_real, create_cif, option to show all; Utility new real_t round function definition. Ayb_model standard (write each line) or cif (store and write at end) output; open/write/close_processed; pass last iter flag to estimate_bases; option to show only part AYB structure; new input format info message. |
| 39    | mu should be a parameter as in AYBc.                                                                          | Requires arg mu (m)                                                                                                                                                                                                                | 21/09/2010 | Adjusts range of quality scores; smaller value produces higher maximum quality score.                                                                                                                                                                                                                                                                                                                                                                                              |
| 40    | Introduce a diagonal delta to the solver routines (ridge regression); avoids failure to solve when data bad . | Use value 1 which is small compared with typical matrix values.                                                                                                                                                                    | 26/08/2010 | Value stored in ayb_model as constant DELTA_DIAG.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 41    | Count zero lambdas for each file and output at end if any.                                                    | Output per iteration.                                                                                                                                                                                                              | 25/08/2010 | Store in ayb_model. Create string for message with count for each iteration.                                                                                                                                                                                                                                                                                                                                                                                                       |
| 42    | Stop and issue message if data error detected.                                                                | Initially failure to calculate covariance.                                                                                                                                                                                         | 26/08/2010 | New call_base_null, same as used for zero lambda. estimate_bases can return err val.                                                                                                                                                                                                                                                                                                                                                                                               |
| 43    | Remove padding zeros from output cluster line.                                                                | There are typically > 10,000 clusters but could be any number.                                                                                                                                                                     | 21/09/2010 | In ayb_model output_results.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 44    | Couple of bugs in string length allocation.                                                                   | Cause segment errors.                                                                                                                                                                                                              | 25/08/2010 | In dirio: output_name(_cif), calculation of newname length requires bracket around blk query part or result seems to always be 1; scan_inputs fixed buffer insufficient.                                                                                                                                                                                                                                                                                                           |
| 45    | Make double calculations standard.                                                                            | Accuracy of float not sufficient for larger values.                                                                                                                                                                                | 25/08/2010 | Rename original makefile to makefloat (not controlled).                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Index | Task                                                                                         | Additional Requirements                                                                                                  | Completed                | Notes                                                                                                                                                                                             |
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| 35    | Allow selection of routines to solve for P. Remove simultaneous solve for P and N (from TM). | Alternatives are: Standard SVD; Standard SVD then zero negative entries; Non-negative least squares. New arg solver (S). | 09/07/2010<br>28/07/2010 | Changes to help, model, mpn, matrix error. Need fortran compiler switch out (NFORTTRAN) for eclipse.                                                                                              |
| 36    | Unit test of MPN estimation.                                                                 | Already exists in an old form but requires changes; coercing values into array/cluster/tile; other bits.                 | 23/07/2010               | coerce matrix and expanded to array/cluster/tile. Calculate intermediates and new values.                                                                                                         |
| 37    | Option to read Intensity data in cif format.                                                 | Get from AYBc; convert intensities access from single array to via cluster list. Requires arg dataformat (d).            | 21/07/2010               | Adopt cif. Store input format in dirio; alternatives for file search and output filename. New read_cif_tile/cluster. In model alternative read and output filename. New debug output constraints. |
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| Index | Task                                           | Additional Requirements                                                                                                                                                                                                                                                                                                                                         | Completed  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| 32    | Process Intensities file for analysis by block | New argument blockstring (b) of the form: InRnCn, decoded as:<br>I=>ignore<br>R=>read<br>C=>concatenate to previous block<br>Note no difference in analysis for forward and backward data. Then:<br>less data than specified=>abort program;<br>more data than specified=>warn and continue<br>Add letter extension to output file name if more than one block. | 09/06/2010 | Replace option cycles (c) with blockstring (b).<br>New datablock class for datablock structure.<br>Create tile/cluster/matrix append functions.<br>Pre-process input tile and create an array of sub-tile pointers.<br>Add ncycle to TILE structure. No longer need ncycle return from tile.<br>Change action if not enough cycles; message if spare cycles (pass flag on to read matrix line to check if first line).<br>In read_tile error if later clusters have < cycles than previous; indicates a faulty file.<br>New open_output_blk adds a block suffix letter.<br>Analysis now a loop. |
| 33    | Implement Quality Scores                       | Actually 2 alternative outputs fasta/fastq. Requires arg format (f).                                                                                                                                                                                                                                                                                            | 16/06/2010 | Function match_string to utility.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 34    | Implement MPN estimation.                      | Get from AYBc; convert intensities access from single array to via cluster list. Use MPN initialisation as in AYBc.                                                                                                                                                                                                                                             | 15/06/2010 | Need new modules mpn, statistics; new functions update_cluster_weights, estimate_MPN (model), expected_intensities (intensities), some matrix and lapack.<br>Read-in matrices become optional; new dirio func to say matrix specified.                                                                                                                                                                                                                                                                                                                                                          |
|       |                                                |                                                                                                                                                                                                                                                                                                                                                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| Index | Task                                                                           | Additional Requirements                                                          | Completed  | Notes                                                                                                                                                                                                                                                     |
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| 18    | Calculate Covariance                                                           |                                                                                  | 11/05/2010 | Put in ayb_model not call_bases because uses structure of AYB. Scale reciprocal removed.                                                                                                                                                                  |
| 19    | Estimate Lambda                                                                |                                                                                  | 12/05/2010 | Use estimate_lambdaWLS as originally described.                                                                                                                                                                                                           |
| 20    | Call Bases                                                                     |                                                                                  | 11/05/2010 | Constant Mu used for quality score.                                                                                                                                                                                                                       |
| 21    | Base Call Loop                                                                 | Requires args niter (n); change ncycles to c                                     | 12/05/2010 | Niter static in ayb_model.                                                                                                                                                                                                                                |
| 22    | Utility: Reimplement xfree null return                                         | Use ** or return, could apply to all free_* functions                            | 13/05/2010 | Used by free_AYB/CSTRING/(MAT)/CLUSTER/TILE. Leave xfree returning void and instead return null pointer from free_functions. Do not have to have a return in call to free_x if not needed, e.g. a local var. ARRAY/LIST never freed where return matters. |
| 23    | XIO: Check and amend file structure handling; nulls etc.; null return on close | Make interface as close to normal file handle as possible                        | 17/05/2010 | Free structure and return null pointer if open fails. Return null pointer on close (different from normal file handle operation)                                                                                                                          |
| 24    | XIO: rename initialise_aybstd to not contain 'ayb'                             |                                                                                  | 13/05/2010 |                                                                                                                                                                                                                                                           |
| 25    | I/O: If input file open fails then warn and carry on                           | But stop if output fails as all will                                             | 17/05/2010 | Dirio open_output: loop until successful open.                                                                                                                                                                                                            |
| 26    | I/O: Output files should not be compressed                                     | Test: compressed input, input with no extension, input with no delimiter, combo? | 18/05/2010 |                                                                                                                                                                                                                                                           |
| 27    | I/O: Create output directories if do not exist                                 | Include log; abort if create fails.                                              | 18/05/2010 | Exist, no exist, exist file not dir.                                                                                                                                                                                                                      |
| 28    | I/O: Intensities: Expand fixed match to "_int.txt"                             | As original                                                                      | 17/05/2010 |                                                                                                                                                                                                                                                           |
| 29    | Program log: Replace fixed "ayb" with prefix                                   | hhmm not sufficient for parallel runs                                            | 19/05/2010 |                                                                                                                                                                                                                                                           |
| 30    | Program log: Add initial information line                                      | Program name, date/time                                                          | 19/05/2010 | AYB Message Log; user name and datetime                                                                                                                                                                                                                   |
| 31    | Program log: switch order of warning and information                           |                                                                                  | 19/05/2010 |                                                                                                                                                                                                                                                           |

| Index | Task                                                     | Additional Requirements                                              | Completed                | Notes                                                      |
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| 9     | Matrix Input: Locate, read, store, tidy up; Read M, N, P | Requires args M (M), N (N), P (P);                                   | 13/04/2010<br>16/04/2010 | Read and written, not stored.<br>Stored in new ayb_model.  |
| 10    | Processed Intensities: Calculate and store, tidy up      | AYB struct taken from AYBc with int16 intensities replaced with tile | 20/04/2010               |                                                            |
| 11    | Initial Sequence: By maximum intensity                   | use call_base_simple                                                 | 20/04/2010               |                                                            |
| 12    | Sequence output: Create file, write data, close          |                                                                      | 21/04/2010               | NUC needs raw type file? NUC changed to use XFILE          |
| 16    | Matrix: Add read_methods for multiple styles             | 1) Intensities 2) As rows of columns. Move matrix read from cluster. | 13/04/2010               | New functions new_MAT_from_line, read_MAT_from_column_file |
| 17    | Initial Lambda: Ignore weights                           | use estimate_lambdaOLS                                               | 26/04/2010               |                                                            |
|       |                                                          |                                                                      |                          |                                                            |
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**Notes**

array.def  
tile  
dirio

Changes from git central  
Changes from git central  
Store location of predetermined matrices; new open\_matrix; new method returns name of current file (for message).

matrix

set\_MAT, transpose\_inplace, invert taken from AYBc.

lapack

For matrix, getrf/i taken from AYBc.

nuc

Taken from AYBc; defines NUC and PHREDCHAR types; isprob taken from utility.

New rcons\*\_list to appends to a given node (should be last)  
New read\_TILE keeps cluster list in input file order  
set\_path becomes more generic set\_location;

In invert change WORK/WORKSPACE type to real\_t

change WORK type to float in sgetri  
Read/show changed to use XFILE; show\_PHREDCHAR print space if out of range; replace printf with message  
NUC\_\*, \*\_PHRED do not need to be public? NUC\_ to enum?  
What about array construct?

|                 |                                                                           |                            |
|-----------------|---------------------------------------------------------------------------|----------------------------|
| call_bases      | New; parts taken from AYBc call_bases (more later).                       |                            |
| intensities     | New; parts taken from AYBc process intensities (more later).              |                            |
| lambda          | New; parts taken from AYBc estimate_lambda (more later).                  |                            |
| ayb_model       | New; parts taken from AYBc ayb. (more later).                             | show_AYB use fp not stderr |
| utility.h       | Remove NBASE def - now in nuc                                             |                            |
| <b>Consider</b> |                                                                           |                            |
| ayb_model       | Make bases & quals a list (per cluster)                                   |                            |
| ayb_model       | Does AYB struct need to be public at all? or even the standard functions? |                            |



| Index | Task                                                     | Additional Requirements                                                          | Completed  | Notes                     |
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| 6     | File I/O: Locate, open/create, read/write, close         | Requires args input (i), output (o); search input dir for pattern matched files. | 24/03/2010 |                           |
| 7     | Data Structures: Tile, Cluster, Matrix                   | Use as is from Central Repository                                                | 01/04/2010 |                           |
| 8     | Intensities Input: Locate, read, store, tidy up          | Requires arg ncycles (n)                                                         | 01/04/2010 |                           |
| 9     | Matrix Input: Locate, read, store, tidy up; Read M, N, P | Use ncycle                                                                       | postponed  |                           |
| 13    | Replace message macros with fprintf                      | Change call function name to message                                             | 12/03/2010 |                           |
| 14    | Expand message severity list to include debug            |                                                                                  | 24/03/2010 |                           |
| 15    | Configure Doxygen; add comments to new HM files          |                                                                                  | 29/03/2010 | Adopted files still to do |
|       |                                                          |                                                                                  |            |                           |
|       |                                                          |                                                                                  |            |                           |
|       |                                                          |                                                                                  |            |                           |

| Index | Task                                                     | Additional Requirements                                                                                                                          | Completed  | Notes                                                                                |
|-------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------|
| 1     | Initial system: Make; Run                                | IDE develop but also build from command line                                                                                                     | 10/03/2010 | Make with gcc. Makefile.                                                             |
| 2     | Program Version                                          | Version file                                                                                                                                     | 08/03/2010 | Store version and date.                                                              |
| 3     | Program arguments:<br>Read and store<br>(infrastructure) | Initial args help, licence, version, usage (default)                                                                                             | 08/03/2010 | Use getopt_long; Use include file method to do bulk output.                          |
| 4     | Program Log:<br>Infrastructure                           | Log message from a Type and Severity; allow for parameters of varying type. Output to unique filename (from date/time) in configurable location. | 10/03/2010 | Requires args logfile (e), loglevel (l); Hide implementation from user.              |
| 5     | Signal Handler                                           | Initially interrupt and floating point exception                                                                                                 | 10/03/2010 | On interrupt get confirmation first. Divide by zero does not cause FPE so not tested |
|       |                                                          |                                                                                                                                                  |            |                                                                                      |
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