IT314 (Software Engineering)

Lab 07

Code inspection, Debugging and Static analysis tool

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Part 1

The Code Is provided after the answers for your reference.

The Answers To The Following Questions :

1. How many errors are there in the program? Mention the errors you have identified.

- DataReference Errors:
  - Uninitialized variables may lead to undefined behavior, particularly when input is not validated.
  - Integer division may cause precision loss, such as z = x / y yielding 0 for integer inputs.
- Data-Declaration Errors:
  - While all variables are declared, some initializations can lead to unexpected outcomes (e.g., uninitialized array elements).
- Computation Errors:
  - Mixing integer division with floating-point arithmetic can result in confusion, illustrated by z = x / y when both x and y are integers.
- Comparison Errors:
  - Errors can occur from comparisons involving different data types or insufficient validation of input types (e.g., array index or user input

comparisons).

● Control-Flow Errors:

○ Loops must be designed to ensure they terminate correctly to prevent infinite loops.

● Interface Errors:

○ It's essential to confirm that functions are called with the correct number and types of parameters to avoid runtime issues.

● Input/Output Errors:

○ User input must be validated to avert potential crashes or unintended behaviors, especially during file or console operations.

● Overall Count:

○ Aminimumof 5-10 potential issues can be pinpointed based on the code fragments and the inspection checklist provided.

2. Which category of program inspection would you find more effective?

● DataReference Errors:

○ This category is likely the most effective, as these errors can lead to runtime exceptions or undefined behavior, which are often hard to debug.

3. Which type of error are you not able to identify using the program inspection?

● Logical Errors:

○ These types of errors are challenging to spot using inspections since the code may run without any syntax issues but still produce incorrect results due to flawed logic.

4. Is the program inspection technique worth applying?

Absolutely, it is worthwhile:

● Thetechnique offers a systematic method to uncover and rectify potential issues before deployment.

● Following a structured checklist enhances code quality and reduces bugs.

● Engaging multiple team members in inspections fosters diverse insights, making the review process more effective.

Part 2: Code Debugging and Program Inspection of the JAVA files

Code 1:

1. Errors Identified:

● Incorrect remainder calculation: Should be num % 10 instead of num / 10.

● Incorrect number reduction: Should be num / 10 instead of num % 10.

2. Number of Breakpoints:

● 2breakpoints:

○ At the remainder calculation.

○ At the number reduction.

2(a). Steps to Fix:

● Step 1: Change remainder = num / 10to remainder = num % 10.

● Step 2: Change num = num % 10tonum = num / 10.

3. Corrected Code:

```
class Armstrong {
public static void main(String args[]) {
int num = Integer.parseInt(args[0]);
int n = num;
int check = 0, remainder;
while (num > 0) {
```

```
remainder = num % 10;
check = check + (int)Math.pow(remainder, 3);
num =num/10;
}
if (check == n)
System.out.println(n + " is an Armstrong Number");
else
System.out.println(n + " is not an Armstrong Number");
}
}
```

Code 2:

1. Errors Identified:

- Incorrect condition in GCD loop: In the gcd method, the while condition should be a % b != 0 instead of a % b == 0.
- Incorrect LCM logic: In the lcm method, the condition should check for a % x == 0 && a % y == 0(bothshoulddividea) instead of a % x != 0 && a % y != 0.

2. Number of Breakpoints:

- 2breakpoints:
  - At the GCDloop condition.
  - At the LCM condition.

2(a). Steps to Fix:

- Step 1: In the gcd method, replace while(a % b == 0) with while(a % b != 0).
- Step 2: In the lcm method, change the condition if(a % x != 0 && a % y != 0)toif(a % x == 0 && a % y == 0).

3. Corrected Code:

```
import java.util.Scanner;
```

```
public class GCD_LCM
{
static int gcd(int x, int y)
{
int r=0, a, b;
a =(x > y) ? y : x; // a is smaller number
b =(x < y) ? x : y; // b is larger number
while(a % b != 0) // Fix: correct condition
{
r = a %b;
a =b;
b =r;
}
return b;
}
static int lcm(int x, int y)
{
int a;
a =(x > y) ? x : y; // a is greater number
while(true)
{
if(a % x == 0 && a %y==0)// Fix: check both divisions
return a;
++a;
}
}
public static void main(String args[])
{
Scanner input = new Scanner(System.in);
```

```
System.out.println("Enter the two numbers: ");
int x = input.nextInt();
int y = input.nextInt();
System.out.println("The GCD of two numbers is: " + gcd(x, y));
System.out.println("The LCM of two numbers is: " + lcm(x, y));
input.close();
}
}
```

Code 3:

1. Errors Identified:

- Incorrect increment for n in the loop: The line int option1 = opt[n++][w]; mistakenly increments n. It should be opt[n-1][w] to avoid skipping iterations.
- Incorrect profit calculation when taking the item: The line int option2 = profit[n-2] + opt[n-1][w-weight[n]]; wrongly accesses profit[n-2]. It should access profit[n] to get the current item's profit.

2. Number of Breakpoints:

- 2breakpoints:
  - At the calculation of option1.
  - At the calculation of option2.

2(a). Steps to Fix:

- Step 1: Replace opt[n++][w] with opt[n-1][w] to fix incorrect item selection.
- Step 2: Replace profit[n-2] with profit[n] to correctly add the current item's profit.

3. Corrected Code:

```
public class Knapsack {
```

```
public static void main(String[] args) {
int N = Integer.parseInt(args[0]); // number of items
int W = Integer.parseInt(args[1]); // maximum weight of
knapsack
int[] profit = new int[N+1];
int[] weight = new int[N+1];
// generate random instance, items 1..N
for (int n = 1; n <= N; n++) {
profit[n] = (int) (Math.random() * 1000);
weight[n] = (int) (Math.random() * W);
}
// opt[n][w] = max profit of packing items 1..n with weight limit w
// sol[n][w] = does opt solution to pack items 1..n with weight limit
winclude item n?
int[][] opt = new int[N+1][W+1];
boolean[][] sol = new boolean[N+1][W+1];
for (int n = 1; n <= N; n++) {
for (int w = 1; w <= W; w++) {
// don't take item n
int option1 = opt[n-1][w]; // Fix: use n-1
// take item n
int option2 = Integer.MIN_VALUE;
if (weight[n] <= w) {
option2 = profit[n] + opt[n-1][w-weight[n]]; // Fix: use
profit[n]
}
}
// select better of two options
opt[n][w] = Math.max(option1, option2);
```

```
sol[n][w] = (option2 > option1);
}
// determine which items to take
boolean[] take = new boolean[N+1];
for (int n = N, w = W; n > 0; n--) {
if (sol[n][w]) {
take[n] = true;
w=w-weight[n];
} else {
take[n] = false;
}
}
// print results
System.out.println("item" + "\t" + "profit" + "\t" + "weight" + "\t" +
"take");
for (int n = 1; n <= N; n++) {
System.out.println(n + "\t" + profit[n] + "\t" + weight[n] + "\t" +
take[n]);
}
}
}
```

Code 4:

1. Errors Identified:

- Incorrect while condition in inner loop: The condition while(sum == 0)is incorrect. It should be while(sum > 0) to process the digits.
- Incorrect multiplication in inner loop: The line s = s * (sum / 10); is incorrect. It should be s = s + (sum % 10); to sum

up the digits.

● Missing semicolon after sum = sum % 10;.

2. Number of Breakpoints:

● 3breakpoints:

○ At the inner loop condition.

○ At the digit summation.

○ After the missing semicolon.

2(a). Steps to Fix:

● Step 1: Change while(sum == 0) to while(sum > 0).

● Step 2: Replace s = s * (sum / 10);withs = s + (sum % 10);.

● Step 3: Add a semicolon after sum = sum % 10;.

3. Corrected Code:

```
import java.util.*;
public class MagicNumberCheck
{
public static void main(String args[])
{
Scanner ob = new Scanner(System.in);
System.out.println("Enter the number to be checked.");
int n = ob.nextInt();
int sum = 0, num = n;
while(num > 9)
{
sum = num;
int s = 0;
while(sum > 0) // Fix: change condition to sum > 0
{
s = s+(sum %10); // Fix: sum digits
```

```
sum = sum/ 10; // Fix: divide sum by 10 to move to next
digit
}
num =s; // update num to new sum of digits
}
if(num == 1)
{
System.out.println(n + " is a Magic Number.");
}
else
{
System.out.println(n + " is not a Magic Number.");
}
}
}
```

Code 5:

1. Errors Identified:

- Incorrect array references in mergeSort:
  - leftHalf(array+1) and rightHalf(array-1) are incorrect operations on arrays. It should just pass array to both leftHalf and rightHalf.
  - Theoperations merge(array, left++, right--) are invalid because you cannot increment/decrement arrays. You should pass left and right as they are.

2. Number of Breakpoints:

- 2breakpoints:
  - Whensplitting the array into halves.
  - Whenmerging the sorted arrays.

2(a). Steps to Fix:

- Step 1: Replace leftHalf(array+1) with leftHalf(array) and rightHalf(array-1) with rightHalf(array) in the mergeSort method.
- Step 2: Change merge(array, left++, right--) to merge(array, left, right) to correctly pass the arrays.

3. Corrected Code:

```
import java.util.*;
public class MergeSort {
public static void main(String[] args) {
int[] list = {14, 32, 67, 76, 23, 41, 58, 85};
System.out.println("before: " + Arrays.toString(list));
mergeSort(list);
System.out.println("after: " + Arrays.toString(list));
}
// Places the elements of the given array into sorted order
// using the merge sort algorithm.
// post: array is in sorted (nondecreasing) order
public static void mergeSort(int[] array) {
if (array.length > 1) {
// split array into two halves
int[] left = leftHalf(array); // Fix: pass array
int[] right = rightHalf(array); // Fix: pass array
// recursively sort the two halves
mergeSort(left);
mergeSort(right);
// merge the sorted halves into a sorted whole
merge(array, left, right); // Fix: pass left and right
}
```

```
}
// Returns the first half of the given array.
public static int[] leftHalf(int[] array) {
int size1 = array.length / 2;
int[] left = new int[size1];
for (int i = 0; i < size1; i++) {
left[i] = array[i];
}
return left;
}
// Returns the second half of the given array.
public static int[] rightHalf(int[] array) {
int size1 = array.length / 2;
int size2 = array.length- size1;
int[] right = new int[size2];
for (int i = 0; i < size2; i++) {
right[i] = array[i + size1];
}
return right;
}
// Merges the given left and right arrays into the given
// result array.
// pre : result is empty; left/right are sorted
// post: result contains result of merging sorted lists;
public static void merge(int[] result,
int[] left, int[] right) {
int i1 = 0; // index into left array
int i2 = 0; // index into right array
for (int i = 0; i < result.length; i++) {
```

```
if (i2 >= right.length || (i1 < left.length &&
left[i1] <= right[i2])) {
result[i] = left[i1]; // take from left
i1++;
} else {
result[i] = right[i2]; // take from right
i2++;
}
}
}
}
```

Code 6:

1. Errors Identified:

- Incorrect indexing in the multiplication loop:
  - In the statement first[c-1][c-k], second[k-1][k-d], the index should not involve-1. The correct form should be first[c][k] and second[k][d].
- Incorrect prompt for second matrix input: The program asks twice for the "number of rows and columns of the first matrix" instead of the second matrix in the second prompt.

2. Number of Breakpoints:

- 2breakpoints:
  - Fix incorrect array index calculation in the multiplication.
  - Correct the second matrix input prompt.

2(a). Steps to Fix:

- Step 1: Remove-1 in the indices in the multiplication loop, replacing first[c-1][c-k] with first[c][k] and

second[k-1][k-d] with second[k][d].

● Step 2: Correct the prompt to ask for the "number of rows and columns of second matrix."

3. Corrected Code:

```
import java.util.Scanner;
class MatrixMultiplication {
public static void main(String args[]) {
int m, n, p, q, sum = 0, c, d, k;
Scanner in = new Scanner(System.in);
System.out.println("Enter the number of rows and columns of first matrix");
m=in.nextInt();
n =in.nextInt();
int first[][] = new int[m][n];
System.out.println("Enter the elements of first matrix");
for (c = 0; c < m; c++)
for (d = 0; d < n; d++)
first[c][d] = in.nextInt();
System.out.println("Enter the number of rows and columns of second matrix"); // Fix: second matrix prompt
p =in.nextInt();
q =in.nextInt();
if (n != p)
System.out.println("Matrices with entered orders can't be multiplied with each other.");
else {
int second[][] = new int[p][q];
int multiply[][] = new int[m][q];
System.out.println("Enter the elements of second matrix");
```

```
for (c = 0; c < p; c++)
for (d = 0; d < q; d++)
second[c][d] = in.nextInt();
for (c = 0; c < m; c++) {
for (d = 0; d < q; d++) {
for (k = 0; k < n; k++) { // Fix: correct indexing for
multiplication
sum = sum+first[c][k] * second[k][d];
}
multiply[c][d] = sum;
sum = 0;
}
}
System.out.println("Product of entered matrices:");
for (c = 0; c < m; c++) {
for (d = 0; d < q; d++)
System.out.print(multiply[c][d] + "\t");
System.out.print("\n");
}
}
in.close();
}
}
```

Code 7:

1. Errors Identified:

- Syntax Error: The statement i + = (i + h / h--) %
maxSize; should be corrected to i = (i + h * h++) %
maxSize;. This is a misplaced operator and should use * for

quadratic probing, and the increment of h should be done correctly.

● Logic Error in Rehashing: In the rehashing logic after removal, the statement currentSize--; is written twice, which will incorrectly reduce the current size of the hash table.

2. Number of Breakpoints:

● 2breakpoints:

○ Fix the syntax error in the probing formula.

○ Correct the rehashing logic to avoid decrementing currentSize twice.

2(a). Steps to Fix:

Step 1: Replace i + = (i + h / h--) % maxSize;withi = (i + h * h++) % maxSize;intheinsertmethod.

● Step 2: Remove the duplicate currentSize--; in the remove method.

3. Corrected Code:

```
import java.util.Scanner;
/** Class QuadraticProbingHashTable **/
class QuadraticProbingHashTable {
private int currentSize, maxSize;
private String[] keys;
private String[] vals;
/** Constructor **/
public QuadraticProbingHashTable(int capacity) {
currentSize = 0;
maxSize = capacity;
keys = new String[maxSize];
vals = new String[maxSize];
}
```

```
/** Function to clear hash table **/
public void makeEmpty() {
currentSize = 0;
keys = new String[maxSize];
vals = new String[maxSize];
}
/** Function to get size of hash table **/
public int getSize() {
return currentSize;
}
/** Function to check if hash table is full **/
public boolean isFull() {
return currentSize == maxSize;
}
/** Function to check if hash table is empty **/
public boolean isEmpty() {
return getSize() == 0;
}
return null;
}
/** Function to remove key and its value **/
public void remove(String key) {
if (!contains(key))
return;
/** find position key and delete **/
int i = hash(key), h = 1;
while (!key.equals(keys[i]))
i = (i + h * h++) % maxSize;
keys[i] = vals[i] = null;
```

```
/** rehash all keys **/
for (i = (i + h * h++) % maxSize; keys[i] != null; i = (i + h * h++) % maxSize) {
String tmp1 = keys[i], tmp2 = vals[i];
keys[i] = vals[i] = null;
currentSize--;
insert(tmp1, tmp2);
}
// Fix: Remove the /**Function to check if hash table contains a key **/
public boolean contains(String key) {
return get(key) != null;
}
/** Function to get hash code of a given key **/
private int hash(String key) {
return key.hashCode() % maxSize;
}
/** Function to insert key-value pair **/
public void insert(String key, String val) {
int tmp = hash(key);
int i = tmp, h = 1;
do {
if (keys[i] == null) {
keys[i] = key;
vals[i] = val;
currentSize++;
return;
}
if (keys[i].equals(key)) {
vals[i] = val;
return;
```

```
}
i = (i + h * h++) % maxSize; // Fix: Corrected probing formula
} while (i != tmp);
}
/** Function to get value for a given key **/
public String get(String key) {
int i = hash(key), h = 1;
while (keys[i] != null) {
if (keys[i].equals(key))
return vals[i];
i = (i + h * h++) % maxSize;
}
```

Code 8:

1. Errors in the Code:

1. Class Name: Ascending _Order has a space in the class name, which is invalid. It should be AscendingOrder.
2. Condition in Sorting Loop: The loop condition for (int i = 0; i >= n; i++);isincorrect. It should be for (int i = 0; i < n; i++)toiterate over the array.
3. Incorrect Comparison in Sorting Logic: In the if statement if (a[i] <= a[j]), it should be if (a[i] > a[j]) for ascending order sorting.
4. Array Traversal in Output: The last element of the array should be printed after the loop, and there should be no extra , after the last element.

2. Corrected Code:

```
import java.util.Scanner;
public class AscendingOrder {
```

```
public static void main(String[] args) {
int n, temp;
Scanner s = new Scanner(System.in);
System.out.print("Enter no. of elements you want in array: ");
n =s.nextInt();
int a[] = new int[n];
System.out.println("Enter all the elements:");
for (int i = 0; i < n; i++) {
a[i] = s.nextInt();
}
// Sorting array in ascending order
for (int i = 0; i < n; i++) {
for (int j = i + 1; j < n; j++) {
if (a[i] > a[j]) { // Corrected condition for ascending order
temp = a[i];
a[i] = a[j];
a[j] = temp;
}
}
}
// Display sorted array
System.out.print("Ascending Order: ");
for (int i = 0; i < n- 1; i++) {
System.out.print(a[i] + ", ");
}
System.out.print(a[n- 1]); // Print last element without a trailing comma
}
}
```

Code 9:

1. Number of Errors Identified:

● Total Errors: 1 error

● Identified Error:

○ Print Loop Issue: The print loop incorrectly iterates until n- 1, which could lead to confusion when displaying the last

element. Although this does not cause a runtime error, it

can result in an incorrect display format if not handled

properly.

2. Number of Breakpoints to Fix Errors:

● Total Breakpoints Needed: 1 breakpoint

● Steps to Fix the Identified Error:

○ Change the print loop to correctly display the last element

without a trailing comma. Modify the code in the display

section as follows:

■ Instead of using for (int i = 0; i < n- 1;

i++), simply iterate through all elements and

conditionally add a comma after each element except

the last.

3. Corrected Code:

```
import java.util.Scanner;
public class AscendingOrder {
public static void main(String[] args) {
int n, temp;
Scanner s = new Scanner(System.in);
System.out.print("Enter no. of elements you want in array: ");
n =s.nextInt();
int a[] = new int[n];
System.out.println("Enter all the elements:");
```

```
for (int i = 0; i < n; i++) {
a[i] = s.nextInt();
}
// Sorting array in ascending order
for (int i = 0; i < n; i++) {
for (int j = i + 1; j < n; j++) {
if (a[i] > a[j]) { // Corrected condition for ascending order
temp = a[i];
a[i] = a[j];
a[j] = temp;
}
}
}
// Display sorted array
System.out.print("Ascending Order: ");
for (int i = 0; i < n; i++) { // Updated loop to include all elements
System.out.print(a[i]);
if (i < n- 1) { // Print comma only if it's not the last element
System.out.print(", ");
}
}
}
}
```

Code 10:

1. Errors Identified:

- Incorrect Increment/Decrement Usage:
  - Theuse of topN++, inter--, from+1, and to+1 in the recursive calls is incorrect. These expressions do not

modify the values as intended. Instead, they should pass the correct arguments directly without modifying them.

- Incorrect Logic for Recursive Calls:
  - Therecursion for moving disks does not properly implement the Tower of Hanoi logic, leading to incorrect moves.
- Missing Semicolon:
  - There's a missing semicolon at the end of the line with doTowers(...) inside the else block.

2. Breakpoints Needed:

- Total Breakpoints: You can set breakpoints on the lines where you have the recursive calls and where the output statements are to trace the logic.
- Steps to Fix Errors:
  - Replace topN++ with topN- 1 in the recursive calls.
  - Replace inter-- with inter and from + 1 and to + 1 with from and to respectively.
  - Ensure all necessary semicolons are included at the end of statements.

3. Corrected Executable Code:

```
public class MainClass {
public static void main(String[] args) {
int nDisks = 3; // Number of disks
doTowers(nDisks, 'A', 'B', 'C'); // A, B and C are names of rods
}
public static void doTowers(int topN, char from, char inter, char to) {
if (topN == 1) {
System.out.println("Disk 1 from " + from + " to " + to);
} else {
```

```
// Move topN- 1 disks from source to auxiliary
doTowers(topN- 1, from, to, inter);
// Move the largest disk from source to destination
System.out.println("Disk " + topN + " from " + from + " to " + to);
// Move the disks from auxiliary to destination
doTowers(topN- 1, inter, from, to);
}
}
}
```

Part 3: Program Inspection/Debugging for Long-code from GitHub

Here is the link for the GitHub code:
https://github.com/puzzlepaint/camera_calibration/blob/master/cmake/FindSuiteSparse.cmake

First 200 Lines Inspection:

Category A: Data Reference Errors

- **Uninitialized Variables:**
  - Variables like SUITESPARSE_ROOT_DIR are referenced early in the script without explicit initialization. This can lead to errors if CMake doesn't automatically resolve them, or if they're not found in the environment as expected.
  - **Recommendation:** Ensure every variable, especially paths and dependency-related variables, is initialized to prevent referencing unset values.

Category B: Data Declaration Errors

- **Implicit Declarations:**
  - Variables such as CHOLMOD_FOUND and CXSparse_FOUND are sometimes set within conditional blocks (if statements) but not always initialized beforehand, which could lead to inconsistent results when checking for dependencies.
  - **Recommendation:** Explicitly declare and initialize all variables at the beginning of the script to ensure they are available for condition checking and modifications.

Category C: Computation Errors

- **Path Concatenation Issues:**
  - The use of find_path() and find_library() may result in incorrect path computation if variables like SUITESPARSE_INCLUDE_DIRS are not concatenated properly with the base paths. If SUITESPARSE_ROOT_DIR is not found correctly, further operations on these paths will fail.
  - **Recommendation:** Add safeguards and checks to ensure paths are concatenated and resolved properly before further usage.

Category E: Control-Flow Errors

- **Unnecessary Redundant Checks:**
  - In multiple instances, the script checks for the presence of certain libraries like CHOLMOD, CXSparse, and others, redundantly. These checks are scattered and can lead to redundant file searches.
  - **Recommendation:** Consolidate the search logic and remove unnecessary repetition to improve readability and efficiency.

Category F: Interface Errors

- **Parameter Mismatch in Functions:**
  - When calling find_path() and find_library(), ensure that all required parameters (such as directory locations and file names) are passed correctly. For example, if SuiteSparse_USE_X is expected as an argument, ensure it is initialized properly and passed consistently.
  - **Recommendation:** Standardize how parameters are passed to CMake functions to prevent parameter mismatch.

Category G: Input/Output Errors

- **File Operation Error Handling:**
  - The script opens and attempts to locate several critical files for SuiteSparse, CHOLMOD, etc. However, there is no proper handling of cases where files are not found, which could result in incomplete setups or silent failures.
  - **Recommendation:** Implement error messages or halt the process when critical files or directories are missing, instead of allowing the script to continue with missing components.

Second 200 Lines Inspection:

Category A: Data Reference Errors

- **Undefined Dependencies:**

    - SUITESPARSE_LIBRARIES may reference dependencies that are not fully defined or located correctly. Missing paths to essential libraries like CHOLMOD and UMFPACK can cause failures at compile-time.
    - **Recommendation:** Check if each library is properly found and provide warnings or errors if any dependency is missing.

Category B: Data Declaration Errors

- **Array Initialization and Usage:**
    - SUITESPARSE_LIBRARIES is used as a list to store multiple libraries. However, it is not explicitly initialized in all places, which could lead to improper usage or undefined behavior during list operations.
    - **Recommendation:** Always initialize arrays and lists before appending values. Ensure SUITESPARSE_LIBRARIES is an empty list before adding to it.

Category C: Computation Errors

- **Incorrect Logic in Path Setting:**
    - When constructing paths to libraries or include directories, the use of variables like SUITESPARSE_LIBRARY_DIRS and SUITESPARSE_INCLUDE_DIRS might result in incorrect paths if conditions are not properly handled (e.g., when SuiteSparse components are installed in non-standard directories).
    - **Recommendation:** Use clear logic to handle different path structures and check whether paths are valid after being constructed.

Category E: Control-Flow Errors

- **Confusing Conditional Statements:**
    - Conditional blocks such as if(SUITESPARSE_FOUND) and if(NOT SUITESPARSE_FOUND) may create confusion when spread across different segments of the script. Additionally, the use of these conditionals is repeated, making it harder to trace the flow of operations.
    - **Recommendation:** Consolidate and simplify the condition checks for SUITESPARSE_FOUND and related flags, and ensure they are only checked once when necessary.

Category F: Interface Errors

- **Incorrect Variable Usage in Function Calls:**
    - Variables like SuiteSparse_USE_X and SUITESPARSE_LIBRARY_DIRS need consistent usage when passed to functions like find_package() or find_path(). Inconsistent usage could lead to incorrect library searching.
    - **Recommendation:** Validate that all variables passed to functions are properly defined and formatted to match the expected parameters.

Category G: Input/Output Errors

- **File Handling in SuiteSparse Configuration:**

    - The script frequently looks for specific configuration files (e.g., suitesparse_config.h), but it does not always verify if these files are accessible before proceeding.
    - **Recommendation:** Introduce checks and error messages for failed file access attempts to prevent incomplete or incorrect configuration setups.

Third 200 Lines Inspection:

Category A: Data Reference Errors

- **Potentially Missing Variables in Conditional Blocks:**
    - The script sets certain variables like SUITESPARSE_FOUND, CHOLMOD_FOUND, and CXSparse_FOUND within conditional blocks, which may lead to undefined behavior if those conditions are not met.
    - **Recommendation:** Ensure that key variables are initialized regardless of conditional outcomes, and set default values for them.

Category B: Data Declaration Errors

- **Uninitialized Arrays or Lists:**
    - The array SUITESPARSE_INCLUDE_DIRS is used without explicit initialization in some cases, which could result in incomplete or undefined directory listings for include files.
    - **Recommendation:** Always initialize lists and arrays with default values before adding paths or directories to them.

Category C: Computation Errors

- **Path Resolution Errors in Library Search:**
    - When searching for specific SuiteSparse libraries like UMFPACK or CHOLMOD, improper path resolution could result in these libraries not being located. Additionally, path settings could result in incorrect library linking during the build phase.
    - **Recommendation:** Use additional checks to validate paths after they are set, and ensure that all required directories and files are found correctly.

Category E: Control-Flow Errors

- **Poorly Structured Flow for Library Finding:**
    - The control flow for finding libraries is disorganized in certain sections, with multiple levels of if statements and path checks. This could result in missed paths or skipped checks.
    - **Recommendation:** Refactor the flow to streamline the library search and reduce the number of redundant checks, improving both performance and readability.

Category F: Interface Errors

- **Parameter Mismatch in Calls to Find Functions:**
  - Ensure that the parameters used in function calls such as find_package() match the expected inputs. For instance, variables like CHOLMOD_FOUND should be consistently used when passed as parameters.
  - **Recommendation:** Audit all function calls to ensure that parameters are correctly formatted and match expected values.

Category G: Input/Output Errors

- **Missing File Error Handling:**
  - In various sections, the script attempts to open or read certain files related to SuiteSparse configuration without handling cases where files are missing or unreadable.
  - **Recommendation:** Introduce error handling to halt the process or throw warnings when critical files are not found.

Debugging of the code:

```
error: stray '##' in program
    1 | ## CMake file to locate SuiteSparse and its useful composite projec
ts
      | ^~
main.cpp:2:1: error: stray '##' in program
    2 | ## The first development of this file was made by Windows users who
      | ^~
main.cpp:3:1: error: stray '##' in program
    3 | ## use:
      | ^~
main.cpp:4:1: error: stray '##' in program
    4 | ##  https://github.com/jlblancoc/suitesparse-metis-for-windows
      | ^~
main.cpp:5:1: error: stray '##' in program
    5 | ## Anyway, it should also work on linux (tested on fedora 17 when y
ou installed suitesparse from yum)
      | ^~
main.cpp:6:1: error: stray '##' in program
    6 | ##
      | ^~
main.cpp:7:1: error: stray '##' in program
    7 | ##
      | ^~
main.cpp:8:1: error: stray '##' in program
    8 | ## Input variables this file can process (variable must be given be
fore find_package(SUITESPARES ...) command) :
      | ^~
main.cpp:9:1: error: stray '##' in program
    9 | ##   * SuiteSparse_VERBOSE                       Default to OFF
      | ^~
main.cpp:10:1: error: stray '##' in program
```

```
    10 | ##   * SuiteSparse_USE_LAPACK_BLAS      Default to OFF. If ON appen
d to SuiteSparse_LIBRARIES the blas and lapack library
       | ^~
main.cpp:11:1: error: stray ‘##’ in program
    11 | ##   Note: SuiteSparse lib usually requires linking to a blas and l
apack library.
       | ^~
main.cpp:12:1: error: stray ‘##’ in program
    12 | ##
       | ^~
main.cpp:13:1: error: stray ‘##’ in program
    13 | ##
       | ^~
main.cpp:14:1: error: stray ‘##’ in program
    14 | ## Help variables this file handles internally :
       | ^~
main.cpp:15:1: error: stray ‘##’ in program
    15 | ##   * SuiteSparse_SEARCH_LIB_POSTFIX           Is set in cache (as
advanced) to look into the right lib/lib64 dir for libraries (user can chan
ge)
       | ^~
main.cpp:16:1: error: stray ‘##’ in program
    16 | ##
       | ^~
main.cpp:17:1: error: stray ‘##’ in program
    17 | ##
       | ^~
main.cpp:18:1: error: stray ‘##’ in program
    18 | ## Variables this file provides :
       | ^~
main.cpp:19:1: error: stray ‘##’ in program
    19 | ##   * SuiteSparse_FOUND                                 True if Sui
teSparse given COMPONENTS include and libraries were found
       | ^~
main.cpp:20:1: error: stray ‘##’ in program
    20 | ##   * SuiteSparse_INCLUDE_DIRS                         Paths conta
ining SuiteSparse needed headers (depend on which COMPONENTS you gave)
       | ^~
main.cpp:21:1: error: stray ‘##’ in program
    21 | ##   * SuiteSparse_LIBRARIES                            Absolute pa
ths of SuiteSparse libs found (depend on which COMPONENTS you gave)
       | ^~
main.cpp:22:1: error: stray ‘##’ in program
    22 | ##   If SuiteSparse_USE_LAPACK_BLAS is set to ON :
       | ^~
main.cpp:23:1: error: stray ‘##’ in program
    23 | ##      * SuiteSparse_LAPACK_BLAS_LIBRARIES     Which contain the l
ibblas and liblapack libraries
       | ^~
main.cpp:24:1: error: stray ‘##’ in program
    24 | ##      On windows:
       | ^~
main.cpp:25:1: error: stray ‘##’ in program
    25 | ##              * SuiteSparse_LAPACK_BLAS_DLL           Which conta
in all required binaries for use libblas and liblapack
       | ^~
```

```
main.cpp:26:1: error: stray ‘##’ in program
   26 | ##
      | ^~
main.cpp:27:1: error: stray ‘##’ in program
   27 | ##
      | ^~
main.cpp:28:1: error: stray ‘##’ in program
   28 | ## Detailed variables this file provide :
      | ^~
main.cpp:29:1: error: stray ‘##’ in program
   29 | ##   * SuiteSparse_<UPPPER_CASE_COMPONENT>_FOUND                True if the given component to look for is found (INCLUDE DIR and LIBRARY)
      | ^~
main.cpp:30:1: error: stray ‘##’ in program
   30 | ##   * SuiteSparse_<UPPPER_CASE_COMPONENT>_INCLUDE_DIR  The path directory where we can find all component header files
      | ^~
main.cpp:31:1: error: stray ‘##’ in program
   31 | ##   * SuiteSparse_<UPPPER_CASE_COMPONENT>_LIBRARY              The file path to the component library
      | ^~
main.cpp:32:1: error: stray ‘##’ in program
   32 | ##   Note: If a component is not found, a SuiteSparse_<UPPPER_CASE_COMPONENT>_DIR cache variable is set to allow user set the search directory.
      | ^~
main.cpp:33:1: error: stray ‘##’ in program
   33 | ##
      | ^~
main.cpp:34:1: error: stray ‘##’ in program
   34 | ##
      | ^~
main.cpp:35:1: error: stray ‘##’ in program
   35 | ## Possible components to find are (maybe some others can be available):
      | ^~
main.cpp:36:1: error: stray ‘##’ in program
   36 | ##   * AMD
      | ^~
main.cpp:37:1: error: stray ‘##’ in program
   37 | ##   * CAMD
      | ^~
main.cpp:38:1: error: stray ‘##’ in program
   38 | ##   * COLAMD
      | ^~
main.cpp:39:1: error: stray ‘##’ in program
   39 | ##   * CCOLAMD
      | ^~
main.cpp:40:1: error: stray ‘##’ in program
   40 | ##   * CHOLMOD  : this lib needs all previous ones. According to how it was built (a single static lib or a full dynamic one), you should look for its dependencies.
      | ^~
main.cpp:41:1: error: stray ‘##’ in program
   41 | ##   * metis (opt): may not be found (depends if suitesparse was built with metis or not) => required by CHOLMOD (optional)
```

```
      | ^~
main.cpp:42:1: error: stray ‘##’ in program
   42 | ##
      | ^~
main.cpp:43:1: error: stray ‘##’ in program
   43 | ##
      | ^~
main.cpp:44:1: error: stray ‘##’ in program
   44 | ## How to use this file :
      | ^~
main.cpp:45:1: error: stray ‘##’ in program
   45 | ##   (opt) set(SuiteSparse_VERBOSE ON)
      | ^~
main.cpp:46:1: error: stray ‘##’ in program
   46 | ##   (opt) set(SuiteSparse_USE_LAPACK_BLAS ON)
      | ^~
main.cpp:47:1: error: stray ‘##’ in program
   47 | ##   ( 1 ) find_package(SuiteSparse) ## metis is not search by defa
ult because it's not a part of suitesparse (suitesparse can be built withou
t metis)
      | ^~
main.cpp:47:38: error: stray ‘##’ in program
   47 | ##   ( 1 ) find_package(SuiteSparse) ## metis is not search by defa
ult because it's not a part of suitesparse (suitesparse can be built withou
t metis)
      |                                      ^~
main.cpp:47:82: warning: missing terminating ' character
   47 | ##   ( 1 ) find_package(SuiteSparse) ## metis is not search by defa
ult because it's not a part of suitesparse (suitesparse can be built withou
t metis)
      |
^
main.cpp:47:82: error: missing terminating ' character
   47 | ##   ( 1 ) find_package(SuiteSparse) ## metis is not search by defa
ult because it's not a part of suitesparse (suitesparse can be built withou
t metis)
      |
^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
main.cpp:48:1: error: stray ‘##’ in program
   48 | ##   ( 2 ) find_package(SuiteSparse COMPONENTS metis CHOLMOD)
## be careful, components are case sensitive
      | ^~
main.cpp:48:73: error: stray ‘##’ in program
   48 | ##   ( 2 ) find_package(SuiteSparse COMPONENTS metis CHOLMOD)
## be careful, components are case sensitive
      |
^~
main.cpp:49:1: error: stray ‘##’ in program
   49 | ##   ( 3 ) find_package(SuiteSparse COMPONENTS metis suitesparse)
## valid on windows (linux has no suitesparse library)
      | ^~
main.cpp:49:73: error: stray ‘##’ in program
   49 | ##   ( 3 ) find_package(SuiteSparse COMPONENTS metis suitesparse)
## valid on windows (linux has no suitesparse library)
      |
^~
```

```
main.cpp:50:1: error: stray ‘##’ in program
   50 | ##   ( 4 ) find_package(SuiteSparse COMPONENTS suitesparse)
      | ^~
main.cpp:51:1: error: stray ‘##’ in program
   51 | ##
      | ^~
main.cpp:52:1: error: stray ‘##’ in program
   52 | ##    if(SuiteSparse_FOUND)
      | ^~
main.cpp:53:1: error: stray ‘##’ in program
   53 | ##       include_directories(${SuiteSparse_INCLUDE_DIRS})
      | ^~
main.cpp:54:1: error: stray ‘##’ in program
   54 | ##               target_link_library(<myProject> ${SuiteSparse_LIBR
ARIES})
      | ^~
main.cpp:55:1: error: stray ‘##’ in program
   55 | ##        endif()
      | ^~
main.cpp:56:1: error: stray ‘##’ in program
   56 | ##
      | ^~
main.cpp:57:1: error: stray ‘##’ in program
   57 | ## Created by jesnault (jerome.esnault@inria.fr) 2014-01-15
      | ^~
main.cpp:57:39: error: stray ‘@’ in program
   57 | ## Created by jesnault (jerome.esnault@inria.fr) 2014-01-15
      |                                       ^
main.cpp:58:1: error: stray ‘##’ in program
   58 | ## Updated by jesnault (jerome.esnault@inria.fr) 2014-01-21
      | ^~
main.cpp:58:39: error: stray ‘@’ in program
   58 | ## Updated by jesnault (jerome.esnault@inria.fr) 2014-01-21
      |                                       ^
main.cpp:59:1: error: stray ‘##’ in program
   59 | ## Licensed under 3-Claused BSD License. See https://github.com/jlb
lancoc/suitesparse-metis-for-windows/blob/master/LICENSE.md
      | ^~
main.cpp:61:1: error: stray ‘##’ in program
   61 | ## check if global root SuiteSparse folder is set or not and cache
it in order to let user fill it
      | ^~
main.cpp:69:1: error: stray ‘##’ in program
   69 | ## set default verbosity
      | ^~
main.cpp:70:1: error: stray ‘##’ in program
   70 | ## Process the CMake automatically-generated var: SuiteSparse_FIND_
QUIETLY: supersedes *_VERBOSE.
      | ^~
main.cpp:80:1: error: stray ‘##’ in program
   80 | ## set the LIB POSTFIX to find in right directory according to what
kind of compiler we use (32/64bits)
      | ^~
main.cpp:81:1: error: stray ‘##’ in program
```

```
•    81 | ## July 2017 git commit 1618fd1 made so only Linux/BSD/GNU installs
  to lib/lib64, others use lib; this remains to avoid breaking older installs
•       | ^~
• main.cpp:82:34: error: stray ‘#’ in program
•    82 | if(CMAKE_SIZEOF_VOID_P EQUAL 8)  # Size in bytes!
•       |                                  ^
• main.cpp:84:9: error: stray ‘#’ in program
•    84 | else()  # Size in bytes!
•       |         ^
• main.cpp:94:1: error: stray ‘##’ in program
•    94 | ## get CMAKE_INSTALL_BINDIR and CMAKE_INSTALL_LIBDIR
•       | ^~
• main.cpp:97:1: error: stray ‘##’ in program
•    97 | ## This utility macro is used to find all suitesparse projects by g
  iving its name
•       | ^~
• main.cpp:98:1: error: stray ‘##’ in program
•    98 | ## Since the name structure is the same for lib name and include di
  r name,
•       | ^~
• main.cpp:99:1: error: stray ‘##’ in program
•    99 | ## we can use a generic way to find all of these with simple cmake
  lines of code
•       | ^~
• main.cpp:102:9: error: stray ‘##’ in program
•   102 |         ## On windows : we absolutely need SuiteSparse_config.h eve
  ry time for all projects
•       |         ^~
• main.cpp:113:9: error: stray ‘##’ in program
•   113 |         ## special check for suitesparse component (allow to find o
  n windows but not on linux because doesn't exist)
•       |         ^~
• main.cpp:113:108: warning: missing terminating ' character
•   113 |         ## special check for suitesparse component (allow to find o
  n windows but not on linux because doesn't exist)
•       |
  ^
• main.cpp:113:108: error: missing terminating ' character
•   113 |         ## special check for suitesparse component (allow to find o
  n windows but not on linux because doesn't exist)
•       |
  ^~~~~~~~~
• main.cpp:116:17: error: stray ‘##’ in program
•   116 |                 ## do nothing, the user didn't provide the suitespa
  rse componnent
•       |                 ^~
• main.cpp:116:45: warning: missing terminating ' character
•   116 |                 ## do nothing, the user didn't provide the suitespa
  rse componnent
•       |                                             ^
• main.cpp:116:45: error: missing terminating ' character
•   116 |                 ## do nothing, the user didn't provide the suitespa
  rse componnent
•       |                                             ^~~~~~~~~~~~~~~~~~~~~~~
  ~~~~~~~~~~~~~~
• main.cpp:119:25: error: stray ‘##’ in program
```

```
  119 |                         ## do nothing, the user provide the suitesparse componnent we will try to find
      |                         ^~
main.cpp:128:9: error: stray ‘##’ in program
  128 |         ## Look for each component the same way :
      |         ^~
main.cpp:129:9: error: stray ‘##’ in program
  129 |         ##  * For include dir the reference file is the <component>.h
      |         ^~
main.cpp:130:9: error: stray ‘##’ in program
  130 |         ##      * for library fileName the reference is the <component> itself (cmake will prepend/append necessary prefix/suffix according to the platform)
      |         ^~
main.cpp:133:17: error: stray ‘##’ in program
  133 |                 ## used to construct specific cmake variables (in upper case) according to the component, but also used for find_*()
      |                 ^~
main.cpp:137:17: error: stray ‘##’ in program
  137 |                 ## Special case: CXSparse library is named "libcxsparse.*" but headers are "cs.h":
      |                 ^~
main.cpp:138:63: error: stray ‘#’ in program
  138 |                 SET(suitesparseComp_ALT "${suitesparseComp}") # Alternative names
      |                                                               ^
main.cpp:140:55: error: stray ‘#’ in program
  140 |                         SET(suitesparseComp_ALT "cs") # Alternative name of CXSparse
      |                                                       ^
main.cpp:143:17: error: stray ‘##’ in program
  143 |                 ## Special case: suitesparseconfig library is named "libsuitesparseconfig.*" but headers are "SuiteSparse_config.h":
      |                 ^~
main.cpp:145:71: error: stray ‘#’ in program
  145 |                         SET(suitesparseComp_ALT "SuiteSparse_config") # Alternative name of suitesparseconfig
      |                                                                       ^
main.cpp:148:17: error: stray ‘##’ in program
  148 |                 ## try to find include dir (looking for very important header file)
      |                 ^~
main.cpp:168:17: error: stray ‘##’ in program
  168 |                 ## check if found
      |                 ^~
main.cpp:177:17: error: stray ‘##’ in program
  177 |                 ## try to find filepath lib name (looking for very important lib file)
      |                 ^~
main.cpp:212:17: error: stray ‘##’ in program
  212 |                 ## check and auto complete release with debug if release missing and vice versa
      |                 ^~
main.cpp:224:17: error: stray ‘##’ in program
```

```
  224 |                 ## check and append the and SuiteSparse_LIBRARIES l
ist, and warn if not found (release and debug) otherwise
      |                 ^~
main.cpp:227:41: warning: missing terminating " character
  227 |                         message(WARNING "   Failed to find ${suites
parseComp} :
      |                                         ^
main.cpp:227:41: error: missing terminating " character
  227 |                         message(WARNING "   Failed to find ${suites
parseComp} :
      |                                         ^~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~~~~~~
main.cpp:231:25: warning: missing terminating " character
  231 |                         ")
      |                         ^
main.cpp:231:25: error: missing terminating " character
  231 |                         ")
      |                         ^~
main.cpp:237:17: error: stray ‘##’ in program
  237 |                 ## here we allow to find at least the include OR th
e lib dir and just warn if one of both missing
      |                 ^~
main.cpp:244:17: error: stray ‘##’ in program
  244 |                 ## if one or both (include dir or filepath lib), th
en we provide a new cmake cache variable for the search. Otherwise we don't
need anymore to expose all intermediate variables
      |                 ^~
main.cpp:244:141: warning: missing terminating ' character
  244 |                 ## if one or both (include dir or filepath lib), th
en we provide a new cmake cache variable for the search. Otherwise we don't
need anymore to expose all intermediate variables
      |
^
main.cpp:244:141: error: missing terminating ' character
  244 |                 ## if one or both (include dir or filepath lib), th
en we provide a new cmake cache variable for the search. Otherwise we don't
need anymore to expose all intermediate variables
      |
^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
main.cpp:265:17: error: stray ‘##’ in program
  265 |                 ## special definition needed for metis
      |                 ^~
main.cpp:277:9: error: stray ‘##’ in program
  277 |         ## set the final SuiteSparse_FOUND based on all previous co
mponents found (status)
      |         ^~
main.cpp:285:33: error: stray ‘##’ in program
  285 |                         break() ## one component not found is enoug
h to failed
      |                                 ^~
main.cpp:290:1: error: stray ‘##’ in program
  290 | ## Default behavior if user doesn't use the COMPONENTS flag in find
_package(SuiteSparse ...) command
      | ^~
main.cpp:290:34: warning: missing terminating ' character
```

```
  290 | ## Default behavior if user doesn't use the COMPONENTS flag in find_package(SuiteSparse ...) command
      |                                    ^
main.cpp:290:34: error: missing terminating ' character
  290 | ## Default behavior if user doesn't use the COMPONENTS flag in find_package(SuiteSparse ...) command
      |                                    ^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
main.cpp:292:117: error: stray ‘##’ in program
  292 |         list(APPEND SuiteSparse_FIND_COMPONENTS AMD CAMD CCOLAMD COLAMD CHOLMOD SPQR LDL BTF KLU CXSPARSE UMFPACK)  ## suitesparse and metis are not searched by default (special case)
      |
^~
main.cpp:297:1: error: stray ‘##’ in program
  297 | ## check if we have to find also blas and lapack lib for SuiteSparse
      | ^~
main.cpp:300:9: error: stray ‘##’ in program
  300 |         ## set additional search dirs
      |         ^~
main.cpp:321:9: error: stray ‘##’ in program
  321 |         ## try to find blas lib
      |         ^~
main.cpp:338:27: error: invalid preprocessing directive #Send
  338 |                           # Send all msgs as "STATUS": We'll send an error at the bottom, only if "REQUIRED" is set.
      |                             ^~~~
main.cpp:338:56: warning: missing terminating ' character
  338 |                           # Send all msgs as "STATUS": We'll send an error at the bottom, only if "REQUIRED" is set.
      |                                                        ^
main.cpp:349:9: error: stray ‘##’ in program
  349 |         ## try to find lapack lib
      |         ^~
main.cpp:366:27: error: invalid preprocessing directive #Send
  366 |                           # Send all msgs as "STATUS": We'll send an error at the bottom, only if "REQUIRED" is set.
      |                             ^~~~
main.cpp:366:56: warning: missing terminating ' character
  366 |                           # Send all msgs as "STATUS": We'll send an error at the bottom, only if "REQUIRED" is set.
      |                                                        ^
main.cpp:377:9: error: stray ‘##’ in program
  377 |         ## well, now append to the SuiteSparse_LIBRARIES and print infos if VERBOSE
      |         ^~
main.cpp:389:9: error: stray ‘##’ in program
  389 |         ## Now looking for *.dll => note that this is not a safe way to get it...
      |         ^~
main.cpp:421:110: error: stray ‘##’ in program
  421 |                                     file(GLOB SuiteSparse_DLL_${dllPatternUC} "${searchDir}/${dllPattern}*.dll") ## append the *.dll
      |
^~
```

```
main.cpp:446:9: error: stray ‘##’ in program
  446 |         ## This approach doesn't work because the list contains deb
ug information
      |         ^~
main.cpp:446:31: warning: missing terminating ' character
  446 |         ## This approach doesn't work because the list contains deb
ug information
      |                               ^
main.cpp:446:31: error: missing terminating ' character
  446 |         ## This approach doesn't work because the list contains deb
ug information
      |                               ^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~~~~~~~~~
main.cpp:447:9: error: stray ‘##’ in program
  447 |         ## Linker gets messed up, since 1st lib will only be used i
n optimized builds, 2nd lib will only be used in debug builds
      |         ^~
main.cpp:448:10: error: invalid preprocessing directive #list
  448 |         #list(REMOVE_DUPLICATES SuiteSparse_LIBRARIES)
      |          ^~~~
main.cpp:463:1: error: stray ‘##’ in program
  463 | ## Show error if not found and _REQUIRED
      | ^~
main.cpp:465:5: error: invalid preprocessing directive #make
  465 |   # make FIND_PACKAGE friendly
      |     ^~~~
main.cpp:1:4: error: ‘CMake’ does not name a type
    1 | ## CMake file to locate SuiteSparse and its useful composite projec
ts
      |    ^~~~~
main.cpp:53:57: error: expected unqualified-id before ‘)’ token
   53 | ##       include_directories(${SuiteSparse_INCLUDE_DIRS})
      |                                                         ^
main.cpp:54:74: error: expected unqualified-id before ‘)’ token
   54 | ##               target_link_library(<myProject> ${SuiteSparse_LIBR
ARIES})
      |
^
main.cpp:66:47: error: ‘SuiteSparse_DIR’ does not name a type
   66 |         file(TO_CMAKE_PATH ${SuiteSparse_DIR} SuiteSparse_DIR)
      |                                               ^~~~~~~~~~~~~~~
main.cpp:81:99: error: expected unqualified-id before ‘this’
   81 | ## July 2017 git commit 1618fd1 made so only Linux/BSD/GNU installs
to lib/lib64, others use lib; this remains to avoid breaking older installs
      |
^~~~
main.cpp:105:39: error: ‘MATCHES’ does not name a type
  105 |                 if(${SS_config_index} MATCHES "-1")
      |                                       ^~~~~~~
main.cpp:115:24: error: ‘MATCHES’ does not name a type
  115 |         if(${ss_index} MATCHES "-1")
      |                        ^~~~~~~
main.cpp:121:79: error: expected unqualified-id before ‘)’ token
  121 |                         list(REMOVE_AT SuiteSparse_FIND_COMPONENTS
${ss_index})
```

```
      |
  ^
main.cpp:131:63: error: expected unqualified-id before ‘)’ token
  131 |         foreach(suitesparseComp ${SuiteSparse_FIND_COMPONENTS})
      |                                                               ^
main.cpp:134:51: error: ‘suitesparseCompUC’ does not name a type
  134 |                 string(TOUPPER ${suitesparseComp} suitesparseCompUC
  )
      |                                                   ^~~~~~~~~~~~~~~~~
main.cpp:135:51: error: ‘suitesparseCompLC’ does not name a type
  135 |                 string(TOLOWER ${suitesparseComp} suitesparseCompLC
  )
      |                                                   ^~~~~~~~~~~~~~~~~
main.cpp:149:59: error: ‘_INCLUDE_DIR’ does not name a type
  149 |                 find_path(SuiteSparse_${suitesparseCompUC}_INCLUDE_
  DIR
      |                                                           ^~~~~~~~
  ~~~
main.cpp:150:67: error: expected unqualified-id before ‘.’ token
  150 |                         NAMES                   ${suitesparseComp}.
  h ${suitesparseCompLC}.h ${suitesparseCompUC}.h ${suitesparseComp_ALT}.h
      |                                                                   ^
main.cpp:150:90: error: expected unqualified-id before ‘.’ token
  150 |                         NAMES                   ${suitesparseComp}.
  h ${suitesparseCompLC}.h ${suitesparseCompUC}.h ${suitesparseComp_ALT}.h
      |
  ^
main.cpp:150:113: error: expected unqualified-id before ‘.’ token
  150 |                         NAMES                   ${suitesparseComp}.
  h ${suitesparseCompLC}.h ${suitesparseCompUC}.h ${suitesparseComp_ALT}.h
      |
  ^
main.cpp:150:138: error: expected unqualified-id before ‘.’ token
  150 |                         NAMES                   ${suitesparseComp}.
  h ${suitesparseCompLC}.h ${suitesparseCompUC}.h ${suitesparseComp_ALT}.h
      |
  ^
main.cpp:151:67: error: expected unqualified-id before ‘.’ token
  151 |                                                 ${suitesparseComp}.
  hpp ${suitesparseCompLC}.hpp ${suitesparseCompUC}.hpp
      |                                                                   ^
main.cpp:151:92: error: expected unqualified-id before ‘.’ token
  151 |                                                 ${suitesparseComp}.
  hpp ${suitesparseCompLC}.hpp ${suitesparseCompUC}.hpp
      |
  ^
main.cpp:151:117: error: expected unqualified-id before ‘.’ token
  151 |                                                 ${suitesparseComp}.
  hpp ${suitesparseCompLC}.hpp ${suitesparseCompUC}.hpp
      |
  ^
main.cpp:152:67: error: expected unqualified-id before ‘/’ token
  152 |                         HINTS                   ${SuiteSparse_DIR}/
  include
      |                                                                   ^
main.cpp:153:67: error: expected unqualified-id before ‘/’ token
```

```
  153 |                                                 ${SuiteSparse_DIR}/
include/suitesparse
      |                                                                   ^
main.cpp:154:67: error: expected unqualified-id before ‘/’ token
  154 |                                                 ${SuiteSparse_DIR}/
suitesparse/include
      |                                                                   ^
main.cpp:155:67: error: expected unqualified-id before ‘/’ token
  155 |                                                 ${SuiteSparse_DIR}/
include/${suitesparseComp}
      |                                                                   ^
main.cpp:156:49: error: ‘$’ does not name a type
  156 |                                                 ${SuiteSparse_DIR}/
${suitesparseComp}/include
      |                                                 ^
main.cpp:156:67: error: expected unqualified-id before ‘/’ token
  156 |                                                 ${SuiteSparse_DIR}/
${suitesparseComp}/include
      |                                                                   ^
main.cpp:156:86: error: expected unqualified-id before ‘/’ token
  156 |                                                 ${SuiteSparse_DIR}/
${suitesparseComp}/include
      |
^
main.cpp:157:76: error: expected unqualified-id before ‘/’ token
  157 |                                                 ${${suitesparseComp
UC}_DIR}/include
      |
^
main.cpp:158:76: error: expected unqualified-id before ‘/’ token
  158 |                                                 ${${suitesparseComp
UC}_DIR}/${suitesparseComp}/include
      |
^
main.cpp:158:95: error: expected unqualified-id before ‘/’ token
  158 |                                                 ${${suitesparseComp
UC}_DIR}/${suitesparseComp}/include
      |
^
main.cpp:160:25: error: ‘PATHS’ does not name a type
  160 |                         PATHS                   /opt/local/include
      |                         ^~~~~
main.cpp:166:49: error: expected unqualified-id before ‘/’ token
  166 |                                                 /usr/local/include/
${suitesparseComp}
      |                                                 ^
main.cpp:167:17: error: expected unqualified-id before ‘)’ token
  167 |                 )
      |                 ^
main.cpp:169:56: error: ‘_INCLUDE_DIR’ does not name a type
  169 |                 if(NOT SuiteSparse_${suitesparseCompUC}_INCLUDE_DIR
)
      |                                                        ^~~~~~~~~~~
main.cpp:174:112: error: expected unqualified-id before ‘)’ token
  174 |                         list(APPEND SuiteSparse_INCLUDE_DIRS    ${S
uiteSparse_${suitesparseCompUC}_INCLUDE_DIR})
```

```
      |
    ^
main.cpp:178:62: error: ‘_LIBRARY_RELEASE’ does not name a type
  178 |                 find_library(SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE
      |                                                              ^~~~~~~~~~
main.cpp:179:73: error: ‘lib$’ does not name a type
  179 |                         NAMES                   lib${suitesparseComp}   lib${suitesparseCompLC} lib${suitesparseCompUC}
      |                                                         ^~~~
main.cpp:179:97: error: ‘lib$’ does not name a type
  179 |                         NAMES                   lib${suitesparseComp}   lib${suitesparseCompLC} lib${suitesparseCompUC}
      |                                                         ^~~~
main.cpp:180:49: error: ‘$’ does not name a type
  180 |                                                 ${suitesparseComp}${suitesparseCompLC}    ${suitesparseCompUC}
      |                                                 ^
main.cpp:180:81: error: ‘$’ does not name a type
  180 |                                                 ${suitesparseComp}${suitesparseCompLC}    ${suitesparseCompUC}
      |                                                                         ^
main.cpp:180:105: error: ‘$’ does not name a type
  180 |                                                 ${suitesparseComp}${suitesparseCompLC}    ${suitesparseCompUC}
      |                                                                                         ^
main.cpp:181:25: error: ‘HINTS’ does not name a type
  181 |                         HINTS                   ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                         ^~~~~
main.cpp:181:67: error: expected unqualified-id before ‘/’ token
  181 |                         HINTS                   ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                                   ^
main.cpp:182:49: error: ‘$’ does not name a type
  182 |                                                 ${${suitesparseCompUC}_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                 ^
main.cpp:182:76: error: expected unqualified-id before ‘/’ token
  182 |                                                 ${${suitesparseCompUC}_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                                            ^
main.cpp:183:49: error: ‘$’ does not name a type
  183 |                                                 ${${suitesparseCompUC}_DIR}
      |                                                 ^
main.cpp:184:49: error: ‘$’ does not name a type
  184 |                                                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                                 ^
```

```
main.cpp:184:67: error: expected unqualified-id before ‘/’ token
  184 |                                                   ${SuiteSparse_DIR}/
${CMAKE_INSTALL_LIBDIR}
      |                                                                     ^
main.cpp:185:49: error: ‘$’ does not name a type
  185 |                                                   ${${suitesparseComp
UC}_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                                   ^
main.cpp:185:76: error: expected unqualified-id before ‘/’ token
  185 |                                                   ${${suitesparseComp
UC}_DIR}/${CMAKE_INSTALL_LIBDIR}
      |
^
main.cpp:186:25: error: ‘PATHS’ does not name a type
  186 |                         PATHS                     /opt/local/lib${Sui
teSparse_SEARCH_LIB_POSTFIX}
      |                         ^~~~~
main.cpp:187:49: error: expected unqualified-id before ‘/’ token
  187 |                                                   /usr/lib${SuiteSpar
se_SEARCH_LIB_POSTFIX}
      |                                                   ^
main.cpp:188:49: error: expected unqualified-id before ‘/’ token
  188 |                                                   /usr/local/lib${Sui
teSparse_SEARCH_LIB_POSTFIX}
      |                                                   ^
main.cpp:189:49: error: expected unqualified-id before ‘/’ token
  189 |                                                   /opt/local/${CMAKE_
INSTALL_LIBDIR}
      |                                                   ^
main.cpp:190:49: error: expected unqualified-id before ‘/’ token
  190 |                                                   /usr/${CMAKE_INSTAL
L_LIBDIR}
      |                                                   ^
main.cpp:191:49: error: expected unqualified-id before ‘/’ token
  191 |                                                   /usr/local/${CMAKE_
INSTALL_LIBDIR}
      |                                                   ^
main.cpp:192:25: error: ‘PATH_SUFFIXES’ does not name a type
  192 |                         PATH_SUFFIXES   Release
      |                         ^~~~~~~~~~~~~
main.cpp:194:62: error: ‘_LIBRARY_DEBUG’ does not name a type
  194 |                 find_library(SuiteSparse_${suitesparseCompUC}_LIBRA
RY_DEBUG
      |                                                              ^~~~~
~~~~~~~~
main.cpp:195:67: error: ‘d’ does not name a type
  195 |                         NAMES                     ${suitesparseComp}d
${suitesparseCompLC}d           ${suitesparseCompUC}d
      |                                                                     ^
main.cpp:195:101: error: ‘d’ does not name a type
  195 |                         NAMES                     ${suitesparseComp}d
${suitesparseCompLC}d           ${suitesparseCompUC}d
      |
^
main.cpp:195:133: error: ‘d’ does not name a type
```

```
  195 |                         NAMES                   ${suitesparseComp}d ${suitesparseCompLC}d           ${suitesparseCompUC}d
      |
^
main.cpp:196:70: error: ‘d’ does not name a type
  196 |                                                 lib${suitesparseComp}d  lib${suitesparseCompLC}d        lib${suitesparseCompUC}d
      |
^
main.cpp:196:96: error: ‘d’ does not name a type
  196 |                                                 lib${suitesparseComp}d  lib${suitesparseCompLC}d        lib${suitesparseCompUC}d
      |
^
main.cpp:196:128: error: ‘d’ does not name a type
  196 |                                                 lib${suitesparseComp}d  lib${suitesparseCompLC}d        lib${suitesparseCompUC}d
      |
^
main.cpp:197:67: error: expected unqualified-id before ‘/’ token
  197 |                         HINTS                   ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                                                                       ^
main.cpp:198:49: error: ‘$’ does not name a type
  198 |                                                 ${${suitesparseCompUC}_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                 ^
main.cpp:198:76: error: expected unqualified-id before ‘/’ token
  198 |                                                 ${${suitesparseCompUC}_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |
^
main.cpp:199:49: error: ‘$’ does not name a type
  199 |                                                 ${${suitesparseCompUC}_DIR}
      |                                                 ^
main.cpp:200:49: error: ‘$’ does not name a type
  200 |                                                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                                 ^
main.cpp:200:67: error: expected unqualified-id before ‘/’ token
  200 |                                                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                                                                           ^
main.cpp:201:49: error: ‘$’ does not name a type
  201 |                                                 ${${suitesparseCompUC}_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                                 ^
main.cpp:201:76: error: expected unqualified-id before ‘/’ token
  201 |                                                 ${${suitesparseCompUC}_DIR}/${CMAKE_INSTALL_LIBDIR}
      |
^
main.cpp:203:25: error: ‘PATHS’ does not name a type
  203 |                         PATHS                   /opt/local/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
```

```
      |                         ^~~~~
main.cpp:204:49: error: expected unqualified-id before ‘/’ token
  204 |                                                 /usr/lib${SuiteSpar
se_SEARCH_LIB_POSTFIX}
      |                                                 ^
main.cpp:205:49: error: expected unqualified-id before ‘/’ token
  205 |                                                 /usr/local/lib${Sui
teSparse_SEARCH_LIB_POSTFIX}
      |                                                 ^
main.cpp:206:49: error: expected unqualified-id before ‘/’ token
  206 |                                                 /opt/local/${CMAKE_
INSTALL_LIBDIR}
      |                                                 ^
main.cpp:207:49: error: expected unqualified-id before ‘/’ token
  207 |                                                 /usr/${CMAKE_INSTAL
L_LIBDIR}
      |                                                 ^
main.cpp:208:49: error: expected unqualified-id before ‘/’ token
  208 |                                                 /usr/local/${CMAKE_
INSTALL_LIBDIR}
      |                                                 ^
main.cpp:209:25: error: ‘PATH_SUFFIXES’ does not name a type
  209 |                         PATH_SUFFIXES   Debug
      |                         ^~~~~~~~~~~~
main.cpp:213:52: error: ‘_LIBRARY_RELEASE’ does not name a type
  213 |                 if(SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE
)
      |                                                    ^~~~~~~~~~~~~~~~
main.cpp:214:64: error: ‘_LIBRARY_DEBUG’ does not name a type
  214 |                         if(NOT SuiteSparse_${suitesparseCompUC}_LIB
RARY_DEBUG)
      |                                                                ^~~~
~~~~~~~~~~
main.cpp:215:69: error: ‘_LIBRARY_DEBUG’ does not name a type
  215 |                                 set(SuiteSparse_${suitesparseCompUC
}_LIBRARY_DEBUG ${SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE} CACHE P
ATH "Path to a library." FORCE)
      |
^~~~~~~~~~~~~~
main.cpp:215:136: error: ‘CACHE’ does not name a type
  215 |                                 set(SuiteSparse_${suitesparseCompUC
}_LIBRARY_DEBUG ${SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE} CACHE P
ATH "Path to a library." FORCE)
      |
^~~~~
main.cpp:218:52: error: ‘_LIBRARY_DEBUG’ does not name a type
  218 |                 if(SuiteSparse_${suitesparseCompUC}_LIBRARY_DEBUG)
      |                                                    ^~~~~~~~~~~~~~
main.cpp:219:64: error: ‘_LIBRARY_RELEASE’ does not name a type
  219 |                         if(NOT SuiteSparse_${suitesparseCompUC}_LIB
RARY_RELEASE)
      |                                                                ^~~~
~~~~~~~~~~~~
main.cpp:220:69: error: ‘_LIBRARY_RELEASE’ does not name a type
```

```
  220 |                                     set(SuiteSparse_${suitesparseCompUC
}_LIBRARY_RELEASE ${SuiteSparse_${suitesparseCompUC}_LIBRARY_DEBUG} CACHE P
ATH "Path to a library." FORCE)
      |
^~~~~~~~~~~~~~~~
main.cpp:220:136: error: ‘CACHE’ does not name a type
  220 |                                     set(SuiteSparse_${suitesparseCompUC
}_LIBRARY_RELEASE ${SuiteSparse_${suitesparseCompUC}_LIBRARY_DEBUG} CACHE P
ATH "Path to a library." FORCE)
      |
^~~~~
main.cpp:225:56: error: ‘_LIBRARY_RELEASE’ does not name a type
  225 |                 if(NOT SuiteSparse_${suitesparseCompUC}_LIBRARY_REL
EASE AND NOT SuiteSparse_${suitesparseCompUC}_LIBRARY_DEBUG)
      |                                                        ^~~~~~~~~~~
~~~~
main.cpp:225:113: error: ‘_LIBRARY_DEBUG’ does not name a type
  225 |                 if(NOT SuiteSparse_${suitesparseCompUC}_LIBRARY_REL
EASE AND NOT SuiteSparse_${suitesparseCompUC}_LIBRARY_DEBUG)
      |
^~~~~~~~~~~~~~
main.cpp:229:68: error: ‘_DIR’ does not name a type
  229 |                         or set the SuiteSparse_${suitesparseCompUC}
_DIR to look inside,
      |
^~~~
main.cpp:230:73: error: ‘_LIBRARY_DEBUG’ does not name a type
  230 |                         or set directly SuiteSparse_${suitesparseCo
mpUC}_LIBRARY_DEBUG and SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE
      |
^~~~~~~~~~~~~~~
main.cpp:230:124: error: ‘_LIBRARY_RELEASE’ does not name a type
  230 |                         or set directly SuiteSparse_${suitesparseCo
mpUC}_LIBRARY_DEBUG and SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE
      |
^~~~~~~~~~~~~~~~
main.cpp:238:56: error: ‘_INCLUDE_DIR’ does not name a type
  238 |                 if(NOT SuiteSparse_${suitesparseCompUC}_INCLUDE_DIR
AND NOT SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE)
      |                                                        ^~~~~~~~~~~
main.cpp:238:109: error: ‘_LIBRARY_RELEASE’ does not name a type
  238 |                 if(NOT SuiteSparse_${suitesparseCompUC}_INCLUDE_DIR
AND NOT SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE)
      |
^~~~~~~~~~~~~~~~
main.cpp:239:61: error: ‘_FOUND’ does not name a type
  239 |                         set(SuiteSparse_${suitesparseCompUC}_FOUND
OFF)
      |                                                             ^~~~~
main.cpp:241:61: error: ‘_FOUND’ does not name a type
  241 |                         set(SuiteSparse_${suitesparseCompUC}_FOUND
ON)
      |                                                             ^~~~~
main.cpp:245:56: error: ‘_FOUND’ does not name a type
  245 |                 if(NOT SuiteSparse_${suitesparseCompUC}_FOUND)
      |                                                        ^~~~~
```

```
main.cpp:246:61: error: ‘_DIR’ does not name a type
  246 |                         set(SuiteSparse_${suitesparseCompUC}_DIR "$ENV{SuiteSparse_${suitesparseCompUC}_DIR}" CACHE PATH "${suitesparseComp} root directory")
      |                                                                 ^~~~
main.cpp:248:74: error: ‘_INCLUDE_DIR’ does not name a type
  248 |                         mark_as_advanced(SuiteSparse_${suitesparseCompUC}_INCLUDE_DIR)
      |                                                                          ^~~~~~~~~~~~
main.cpp:249:74: error: ‘_LIBRARY_RELEASE’ does not name a type
  249 |                         mark_as_advanced(SuiteSparse_${suitesparseCompUC}_LIBRARY_RELEASE)
      |                                                                          ^~~~~~~~~~~~~~~~
main.cpp:250:74: error: ‘_LIBRARY_DEBUG’ does not name a type
  250 |                         mark_as_advanced(SuiteSparse_${suitesparseCompUC}_LIBRARY_DEBUG)
      |                                                                          ^~~~~~~~~~~~~~
main.cpp:251:68: error: ‘_DIR’ does not name a type
  251 |                         if(DEFINED SuiteSparse_${suitesparseCompUC}_DIR)
      |                                                                    ^~~~
main.cpp:252:82: error: ‘_DIR’ does not name a type
  252 |                                 mark_as_advanced(SuiteSparse_${suitesparseCompUC}_DIR)
      |                                                                                  ^~~~
main.cpp:263:84: error: ‘_FOUND’ does not name a type
  263 |                 list(APPEND SuiteSparse_FOUND_LIST SuiteSparse_${suitesparseCompUC}_FOUND)
      |                                                                                    ^~~~~~
main.cpp:266:43: error: ‘MATCHES’ does not name a type
  266 |                 if(NOT ${suitesparseComp} MATCHES "metis")
      |                                           ^~~~~~~
main.cpp:267:61: error: ‘_DEFINITIONS’ does not name a type
  267 |                         set(SuiteSparse_${suitesparseCompUC}_DEFINITIONS "-DNPARTITION")
      |                                                             ^~~~~~~~~~~~~~
main.cpp:268:88: error: expected unqualified-id before ‘)’ token
  268 |                         add_definitions(${SuiteSparse_${suitesparseCompUC}_DEFINITIONS})
      |                                                                                        ^
main.cpp:278:59: error: expected unqualified-id before ‘)’ token
  278 |         foreach(componentToCheck ${SuiteSparse_FOUND_LIST})
      |                                                           ^
main.cpp:283:43: error: expected unqualified-id before ‘)’ token
  283 |                 if(NOT ${componentToCheck})
      |                                           ^
main.cpp:302:35: error: expected unqualified-id before ‘/’ token
```

```
  302 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                     ^
main.cpp:303:17: error: ‘$’ does not name a type
  303 |                 ${SuiteSparse_DIR}/lapack_windows/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                 ^
main.cpp:303:35: error: expected unqualified-id before ‘/’ token
  303 |                 ${SuiteSparse_DIR}/lapack_windows/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                     ^
main.cpp:304:17: error: ‘$’ does not name a type
  304 |                 ${SuiteSparse_DIR}/lapack_windows/x${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                 ^
main.cpp:304:35: error: expected unqualified-id before ‘/’ token
  304 |                 ${SuiteSparse_DIR}/lapack_windows/x${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                     ^
main.cpp:305:17: error: ‘$’ does not name a type
  305 |                 ${SuiteSparse_DIR}/blas_windows/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                 ^
main.cpp:305:35: error: expected unqualified-id before ‘/’ token
  305 |                 ${SuiteSparse_DIR}/blas_windows/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                     ^
main.cpp:306:17: error: ‘$’ does not name a type
  306 |                 ${SuiteSparse_DIR}/blas_windows/x${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                 ^
main.cpp:306:35: error: expected unqualified-id before ‘/’ token
  306 |                 ${SuiteSparse_DIR}/blas_windows/x${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                     ^
main.cpp:307:17: error: ‘$’ does not name a type
  307 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}/lapack_windows
      |                 ^
main.cpp:307:35: error: expected unqualified-id before ‘/’ token
  307 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}/lapack_windows
      |                                     ^
main.cpp:307:72: error: expected unqualified-id before ‘/’ token
  307 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}/lapack_windows
      |                                                                        ^
main.cpp:308:35: error: expected unqualified-id before ‘/’ token
  308 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}/blas_windows
      |                                     ^
main.cpp:308:72: error: expected unqualified-id before ‘/’ token
  308 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}/blas_windows
```

```
      |
^
main.cpp:309:35: error: expected unqualified-id before ‘/’ token
  309 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POST
FIX}/lapack_blas_windows
      |                                   ^
main.cpp:309:72: error: expected unqualified-id before ‘/’ token
  309 |                 ${SuiteSparse_DIR}/lib${SuiteSparse_SEARCH_LIB_POST
FIX}/lapack_blas_windows
      |
^
main.cpp:310:35: error: expected unqualified-id before ‘/’ token
  310 |                 ${SuiteSparse_DIR}/lapack_blas_windows
      |                                   ^
main.cpp:311:35: error: expected unqualified-id before ‘/’ token
  311 |                 ${SuiteSparse_DIR}/lapack_blas_windows/lib${SuiteSp
arse_SEARCH_LIB_POSTFIX}
      |                                   ^
main.cpp:312:17: error: ‘$’ does not name a type
  312 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                 ^
main.cpp:312:35: error: expected unqualified-id before ‘/’ token
  312 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                   ^
main.cpp:313:17: error: ‘$’ does not name a type
  313 |                 ${SuiteSparse_DIR}/lapack_windows/${CMAKE_INSTALL_L
IBDIR}
      |                 ^
main.cpp:313:35: error: expected unqualified-id before ‘/’ token
  313 |                 ${SuiteSparse_DIR}/lapack_windows/${CMAKE_INSTALL_L
IBDIR}
      |                                   ^
main.cpp:314:17: error: ‘$’ does not name a type
  314 |                 ${SuiteSparse_DIR}/blas_windows/${CMAKE_INSTALL_LIB
DIR}
      |                 ^
main.cpp:314:35: error: expected unqualified-id before ‘/’ token
  314 |                 ${SuiteSparse_DIR}/blas_windows/${CMAKE_INSTALL_LIB
DIR}
      |                                   ^
main.cpp:315:17: error: ‘$’ does not name a type
  315 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/lapack_w
indows
      |                 ^
main.cpp:315:35: error: expected unqualified-id before ‘/’ token
  315 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/lapack_w
indows
      |                                   ^
main.cpp:315:59: error: expected unqualified-id before ‘/’ token
  315 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/lapack_w
indows
      |                                                           ^
main.cpp:316:35: error: expected unqualified-id before ‘/’ token
  316 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/blas_win
dows
      |                                   ^
```

```
main.cpp:316:59: error: expected unqualified-id before ‘/’ token
  316 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/blas_windows
      |                                                           ^
main.cpp:317:35: error: expected unqualified-id before ‘/’ token
  317 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/lapack_blas_windows
      |                                   ^
main.cpp:317:59: error: expected unqualified-id before ‘/’ token
  317 |                 ${SuiteSparse_DIR}/${CMAKE_INSTALL_LIBDIR}/lapack_blas_windows
      |                                                           ^
main.cpp:318:35: error: expected unqualified-id before ‘/’ token
  318 |                 ${SuiteSparse_DIR}/lapack_blas_windows/${CMAKE_INSTALL_LIBDIR}
      |                                   ^
main.cpp:319:9: error: expected unqualified-id before ‘)’ token
  319 |         )
      |         ^
main.cpp:324:64: error: expected unqualified-id before ‘/’ token
  324 |                 HINTS                   ${SuiteSparse_BLAS_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                                ^
main.cpp:325:41: error: ‘$’ does not name a type
  325 |                                         ${SuiteSparse_BLAS_DIR}
      |                                         ^
main.cpp:326:41: error: ‘$’ does not name a type
  326 |                                         ${SuiteSparse_BLAS_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                         ^
main.cpp:326:64: error: expected unqualified-id before ‘/’ token
  326 |                                         ${SuiteSparse_BLAS_DIR}/${CMAKE_INSTALL_LIBDIR}
      |                                                                ^
main.cpp:327:41: error: ‘$’ does not name a type
  327 |                                         ${ADDITIONAL_SEARCH_DIRS}
      |                                         ^
main.cpp:328:17: error: ‘PATHS’ does not name a type
  328 |                 PATHS                   /opt/local/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                 ^~~~~
main.cpp:329:41: error: expected unqualified-id before ‘/’ token
  329 |                                         /usr/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                         ^
main.cpp:330:41: error: expected unqualified-id before ‘/’ token
  330 |                                         /usr/local/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                         ^
main.cpp:331:41: error: expected unqualified-id before ‘/’ token
  331 |                                         /opt/local/${CMAKE_INSTALL_LIBDIR}
      |                                         ^
main.cpp:332:41: error: expected unqualified-id before ‘/’ token
  332 |                                         /usr/${CMAKE_INSTALL_LIBDIR}
```

```
      |                                                ^
main.cpp:333:41: error: expected unqualified-id before ‘/’ token
  333 |                                                /usr/local/${CMAKE_INSTALL_
LIBDIR}
      |                                                ^
main.cpp:334:17: error: ‘PATH_SUFFIXES’ does not name a type
  334 |                 PATH_SUFFIXES   Release Debug
      |                 ^~~~~~~~~~~~~
main.cpp:346:90: error: expected unqualified-id before ‘)’ token
  346 |                 list(APPEND SuiteSparse_LAPACK_BLAS_LIBRARIES ${Sui
teSparse_BLAS_LIBRARY})
      |
^
main.cpp:352:66: error: expected unqualified-id before ‘/’ token
  352 |                 HINTS                          ${SuiteSparse_LAPACK_DIR}/l
ib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                                  ^
main.cpp:353:41: error: ‘$’ does not name a type
  353 |                                                ${SuiteSparse_LAPACK_DIR}
      |                                                ^
main.cpp:354:41: error: ‘$’ does not name a type
  354 |                                                ${SuiteSparse_LAPACK_DIR}/$
{CMAKE_INSTALL_LIBDIR}
      |                                                ^
main.cpp:354:66: error: expected unqualified-id before ‘/’ token
  354 |                                                ${SuiteSparse_LAPACK_DIR}/$
{CMAKE_INSTALL_LIBDIR}
      |                                                                  ^
main.cpp:355:41: error: ‘$’ does not name a type
  355 |                                                ${ADDITIONAL_SEARCH_DIRS}
      |                                                ^
main.cpp:356:17: error: ‘PATHS’ does not name a type
  356 |                 PATHS                          /opt/local/lib${SuiteSparse
_SEARCH_LIB_POSTFIX}
      |                 ^~~~~
main.cpp:357:41: error: expected unqualified-id before ‘/’ token
  357 |                                                /usr/lib${SuiteSparse_SEARC
H_LIB_POSTFIX}
      |                                                ^
main.cpp:358:41: error: expected unqualified-id before ‘/’ token
  358 |                                                /usr/local/lib${SuiteSparse
_SEARCH_LIB_POSTFIX}
      |                                                ^
main.cpp:359:41: error: expected unqualified-id before ‘/’ token
  359 |                                                /opt/local/${CMAKE_INSTALL_
LIBDIR}
      |                                                ^
main.cpp:360:41: error: expected unqualified-id before ‘/’ token
  360 |                                                /usr/${CMAKE_INSTALL_LIBDIR
}
      |                                                ^
main.cpp:361:41: error: expected unqualified-id before ‘/’ token
  361 |                                                /usr/local/${CMAKE_INSTALL_
LIBDIR}
      |                                                ^
main.cpp:362:17: error: ‘PATH_SUFFIXES’ does not name a type
```

```
  362 |                 PATH_SUFFIXES   Release Debug
      |                 ^~~~~~~~~~~~~
main.cpp:374:92: error: expected unqualified-id before ‘)’ token
  374 |                 list(APPEND SuiteSparse_LAPACK_BLAS_LIBRARIES ${SuiteSparse_LAPACK_LIBRARY})
      |                                                                                            ^
main.cpp:379:93: error: expected unqualified-id before ‘)’ token
  379 |                 list(APPEND SuiteSparse_LIBRARIES       ${SuiteSparse_LAPACK_BLAS_LIBRARIES})
      |                                                                                             ^
main.cpp:383:73: error: expected unqualified-id before ‘)’ token
  383 |                         foreach(lib ${SuiteSparse_LAPACK_BLAS_LIBRARIES})
      |                                                                         ^
main.cpp:391:54: error: ‘MATCHES’ does not name a type
  391 |                 if(${SuiteSparse_SEARCH_LIB_POSTFIX} MATCHES "64")
      |                                                      ^~~~~~~
main.cpp:400:50: error: expected unqualified-id before ‘/’ token
  400 |                         ${SuiteSparse_LAPACK_DIR}/lib${SuiteSparse_SEARCH_LIB_POSTFIX}
      |                                                  ^
main.cpp:401:25: error: ‘$’ does not name a type
  401 |                         ${SuiteSparse_LAPACK_DIR}
      |                         ^
main.cpp:402:25: error: ‘$’ does not name a type
  402 |                         ${SuiteSparse_LAPACK_DIR}/bin
      |                         ^
main.cpp:402:50: error: expected unqualified-id before ‘/’ token
  402 |                         ${SuiteSparse_LAPACK_DIR}/bin
      |                                                  ^
main.cpp:403:50: error: expected unqualified-id before ‘/’ token
  403 |                         ${SuiteSparse_LAPACK_DIR}/bin/${SuiteSparse_SEARCH_BIN_POSTFIX_1}
      |                                                  ^
main.cpp:404:25: error: ‘$’ does not name a type
  404 |                         ${SuiteSparse_LAPACK_DIR}/bin/${SuiteSparse_SEARCH_BIN_POSTFIX_2}
      |                         ^
main.cpp:404:50: error: expected unqualified-id before ‘/’ token
  404 |                         ${SuiteSparse_LAPACK_DIR}/bin/${SuiteSparse_SEARCH_BIN_POSTFIX_2}
      |                                                  ^
main.cpp:405:25: error: ‘$’ does not name a type
  405 |                         ${SuiteSparse_LAPACK_DIR}/bin/Release/${SuiteSparse_SEARCH_BIN_POSTFIX_1}
      |                         ^
main.cpp:405:50: error: expected unqualified-id before ‘/’ token
  405 |                         ${SuiteSparse_LAPACK_DIR}/bin/Release/${SuiteSparse_SEARCH_BIN_POSTFIX_1}
      |                                                  ^
main.cpp:406:25: error: ‘$’ does not name a type
  406 |                         ${SuiteSparse_LAPACK_DIR}/bin/Debug/${SuiteSparse_SEARCH_BIN_POSTFIX_2}
```

```
      |                         ^
main.cpp:406:50: error: expected unqualified-id before ‘/’ token
  406 |                         ${SuiteSparse_LAPACK_DIR}/bin/Debug/${Suite
SparseSEARCH_BIN_POSTFIX_2}
      |                                                  ^
main.cpp:407:25: error: ‘$’ does not name a type
  407 |                         ${SuiteSparse_LAPACK_DIR}/${CMAKE_INSTALL_L
IBDIR}
      |                         ^
main.cpp:407:50: error: expected unqualified-id before ‘/’ token
  407 |                         ${SuiteSparse_LAPACK_DIR}/${CMAKE_INSTALL_L
IBDIR}
      |                                                  ^
main.cpp:408:25: error: ‘$’ does not name a type
  408 |                         ${SuiteSparse_BLAS_DIR}
      |                         ^
main.cpp:409:25: error: ‘$’ does not name a type
  409 |                         ${SuiteSparse_BLAS_DIR}/bin
      |                         ^
main.cpp:409:48: error: expected unqualified-id before ‘/’ token
  409 |                         ${SuiteSparse_BLAS_DIR}/bin
      |                                                ^
main.cpp:410:48: error: expected unqualified-id before ‘/’ token
  410 |                         ${SuiteSparse_BLAS_DIR}/bin/${SuiteSparse_S
EARCH_BIN_POSTFIX_1}
      |                                                ^
main.cpp:411:25: error: ‘$’ does not name a type
  411 |                         ${SuiteSparse_BLAS_DIR}/bin/${SuiteSparse_S
EARCH_BIN_POSTFIX_2}
      |                         ^
main.cpp:411:48: error: expected unqualified-id before ‘/’ token
  411 |                         ${SuiteSparse_BLAS_DIR}/bin/${SuiteSparse_S
EARCH_BIN_POSTFIX_2}
      |                                                ^
main.cpp:412:25: error: ‘$’ does not name a type
  412 |                         ${SuiteSparse_BLAS_DIR}/bin/Release/${Suite
SparseSEARCH_BIN_POSTFIX_1}
      |                         ^
main.cpp:412:48: error: expected unqualified-id before ‘/’ token
  412 |                         ${SuiteSparse_BLAS_DIR}/bin/Release/${Suite
SparseSEARCH_BIN_POSTFIX_1}
      |                                                ^
main.cpp:413:25: error: ‘$’ does not name a type
  413 |                         ${SuiteSparse_BLAS_DIR}/bin/Debug/${SuiteSp
arseSEARCH_BIN_POSTFIX_2}
      |                         ^
main.cpp:413:48: error: expected unqualified-id before ‘/’ token
  413 |                         ${SuiteSparse_BLAS_DIR}/bin/Debug/${SuiteSp
arseSEARCH_BIN_POSTFIX_2}
      |                                                ^
main.cpp:414:25: error: ‘$’ does not name a type
  414 |                         ${ADDITIONAL_SEARCH_DIRS}
      |                         ^
main.cpp:415:25: error: expected unqualified-id before string constant
  415 |                         "$ENV{Path}"
      |                         ^~~~~~~~~~~~
```

```
main.cpp:418:57: error: expected unqualified-id before ‘)’ token
  418 |                 foreach(dllPattern ${dllPatternFileList})
      |                                                         ^
main.cpp:419:54: error: ‘dllPatternUC’ does not name a type
  419 |                         string(TOUPPER ${dllPattern} dllPatternUC)
      |                                                      ^~~~~~~~~~~~
main.cpp:420:73: error: expected unqualified-id before ‘)’ token
  420 |                         foreach(searchDir ${SuiteSparse_DLL_SEARCH_
DIRS})
      |
^
main.cpp:421:75: error: expected unqualified-id before string constant
  421 |                                 file(GLOB SuiteSparse_DLL_${dllPatt
ernUC} "${searchDir}/${dllPattern}*.dll") ## append the *.dll
      |
^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
main.cpp:422:77: error: ‘resultCount’ does not name a type
  422 |                                 list(LENGTH SuiteSparse_DLL_${dllPa
tternUC} resultCount)
      |
^~~~~~~~~~~
main.cpp:423:51: error: ‘GREATER’ does not name a type
  423 |                                 if(${resultCount} GREATER "0" )
      |                                                   ^~~~~~~
main.cpp:424:115: error: expected unqualified-id before ‘)’ token
  424 |                                         list(APPEND SuiteSparse_LAP
ACK_BLAS_DLL ${SuiteSparse_DLL_${dllPatternUC}})
      |
^
main.cpp:432:67: error: expected unqualified-id before ‘)’ token
  432 |                         foreach(dll ${SuiteSparse_LAPACK_BLAS_DLL})
      |                                                                   ^
```