



Technische Universität München
Chair of ...

SOME PHD TITLE

Max Muster

Vollständiger Abdruck der von der Ingenieur fakultät Bau Geo
Umwelt der Technischen Universität München zur Erlangung des
akademischen Grades eines

Doktor-Ingenieurs

genehmigten Dissertation.

Vorsitzender:

Univ.-Prof. Dr.-Ing. habil. ...

Prüfer der Dissertation:

1. Univ.-Prof. Dr.-Ing. ...
2. Prof. Dr. ...

Die Dissertation wurde am 3. Juli 2014 bei der Technischen
Universität München eingereicht und durch die Ingenieur fakultät
Bau Geo Umwelt am 31. Dezember 2014 angenommen.

Zusammenfassung

Deutsche Version

Abstract

English version

Acknowledgments

This dissertation was written from 2011 to 2014 during

Max Muster
Technische Universität München
November 20, 2020

CONTENTS

List of Symbols	v
Contents	v
1 Introduction	1
A Algebraic Loops	7
Bibliography	11

An investment in knowledge
pays the best interest.

Benjamin Franklin

CHAPTER 1

INTRODUCTION

“Storm caused wind turbine fire”¹ this headline news is one which the manufacturers and designers of wind turbines try to avoid. The failure or wrong design of a wind turbine shut down mechanism can have a catastrophic consequence as shown in Figure 1.1.

Vector x : \mathbf{x} $\boldsymbol{\alpha}$

Matrix X : \mathbf{X} $\boldsymbol{\Gamma}$

Tensor x : \mathbf{x} $\boldsymbol{\alpha}$

Tensor X : \mathbf{X} $\boldsymbol{\Gamma}$

$\vec{\alpha}$

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore

¹ <http://www.bbc.co.uk/news/uk-16115139> British Broadcasting Corporation [1]

1 Introduction



Figure 1.1: Exploded wind turbine in Ardrossan, North Ayrshire, Scotland due to high winds and problems with the emergency shutdown British Broadcasting Corporation [1]

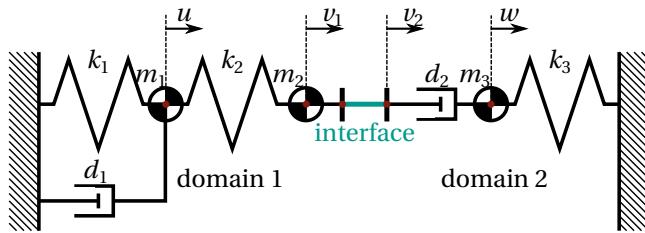


Figure 1.2: Monolithic/co-simulation test problem

et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. see Definition 1.1

Definition 1.1: (Physical) Field

“ A field is a physical quantity that has a value for each point in space and time. ”^a

^a Gribbin [2]

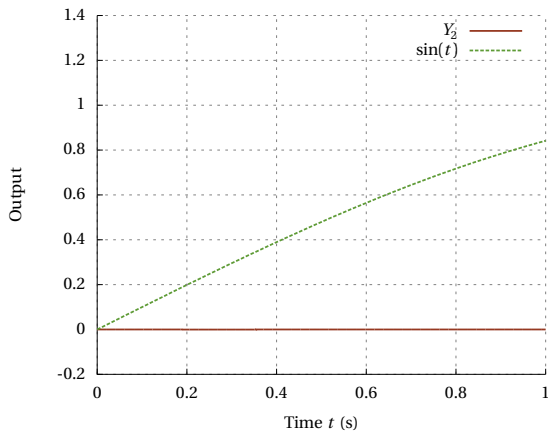


Figure 1.3: Solution over time

Appendices



ALGEBRAIC LOOPS

Figure A.1 which is causing the algebraic loop.
 .. in Listing A.1 for the server and in ..

A.1 Listing: server.c

```

2 // C99
  // Start program: mpirun -np 1 server
4 #include <mpi.h>
  #include <omp.h>
6 #include <stdio.h>
  #include <stdbool.h>
8 #include <unistd.h> // needed for sleep() on POSIX system

10 #define MAX_DATA 100
  int main( int argc, char **argv )
12 {
    int providedThreadSupport;
14    bool terminateListening = false;
    char portName[MPI_MAX_PORT_NAME];
16    MPI_Init_thread(&argc, &argv, MPI_THREAD_MULTIPLE, &
      providedThreadSupport);
    if (MPI_THREAD_MULTIPLE != providedThreadSupport) {
18        printf( "Requested MPI thread support is not guaranteed.\n"
          );
    }
20    MPI_Open_port(MPI_INFO_NULL, portName);
    printf("Server available at port:%s\n", portName);
22    #pragma omp parallel num_threads(2) shared(portName,
      terminateListening)
  
```

A Algebraic Loops

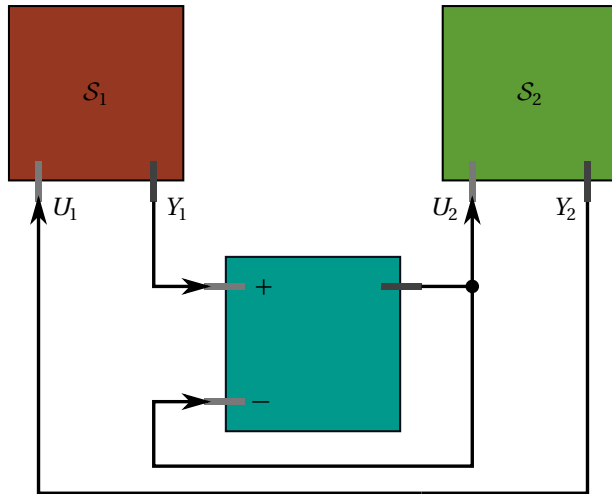


Figure A.1: Block diagram that describes the algebraic loop example

```

24 {
25     // Use OpenMP section construct for function parallelism
26     #pragma omp sections
27     {
28         #pragma omp section
29         {
30             // Do some work
31             sleep(15);
32             // Connect to yourself in order to terminate listening
33             terminateListening = true;
34             MPI_Comm dummy;
35             MPI_Comm_connect(portName, MPI_INFO_NULL, 0,
36                             MPI_COMM_WORLD, &dummy);
37             printf("Server is connected to itself.\n");
38             MPI_Comm_disconnect(&dummy);
39             printf("Server is disconnected.\n");
40             MPI_Close_port(portName);
41         }
42         #pragma omp section
43         {
44             // Listening section
45             while (1) {
46                 MPI_Comm interClient = MPI_COMM_NULL;
47                 MPI_Comm_accept(portName, MPI_INFO_NULL, 0,
48                                 MPI_COMM_WORLD, &interClient);
49                 if (terminateListening == true) {
50                     break;
51                 }
52                 MPI_Status status;
53                 char clientName[MAX_DATA];

```



```

        MPI_Recv(clientName, MAX_DATA, MPI_CHAR,
                  MPI_ANY_SOURCE, MPI_ANY_TAG, interClient, &
                  status);
52      printf("Client is connected with name: %s\n",
              clientName);
        MPI_Comm_disconnect(&interClient);
54      printf("Client is disconnected.\n");
        }
56    } // End of sections
58  } // End of parallel section
  MPI_Finalize();
60  return (0);
}
```


BIBLIOGRAPHY

- [1] British Broadcasting Corporation. *Storm caused wind turbine fire*. Dec. 2011. URL:
<http://www.bbc.co.uk/news/uk-16115139>.
- [2] J. Gribbin. *Q is for Quantum: Particle Physics from A-Z*. Universities Press (India) Pvt. Limited, 1998. ISBN:
9788173712432.