Deltares

Enabling Delta Life

DAMLive

Functional Design

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DAMLive

Functional Design

1210702-000

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Title
DAMLive

Client	Project	Reference	Pages
Deltares - Geo engineering DKS	1210702-000	1210702-000-GEO-0003	12

Classification
-

Keywords
Dike, safety assessment, monitoring, software, macro stability, piping

Summary
This document contains the functional design for DAMLive, a software module that computes the strength of a complete dikering with the use of sensor data and with respect to several failure mechanisms,such as macro stability and piping.

Samenvatting
Dit document bevat het functioneel ontwerp voor DAMLive, een software module die een gebruiker in staat stelt om voor een dijktraject sterkteberekeningen uit te voeren aan de hand van monitoringsdata en voor verschillende faalmechanismen, waaronder macrostabiliteit en piping.

References
Refer to chapter 4.

Version	Date	Author	Initials	Review	Initials	Approval	Initials
0.1	Sep 2018	Irene van der Zwan		Kin Sun Lam André Grijze		Leo Voogt	

Status
draft

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1 Introduction

1.1 Purpose and scope of this document

This document contains the functional design for the DAMLive. The DAMLive is designed for the automated calculation of the strength of dikes with the use of the DAM Engine. DAM was developed by Deltares with and for STOWA for all water authorities. This document describes requirements and functional design of DAMLive. What will actually will be implemented depends on the requirements of the clients using this DAMLive. If some functionality is not (yet) needed, then that part does not need to be implemented.

1.1.1 Future options

As mentioned above this document contains some options that will not be implemented in the first release, but are foreseen to be implemented in the near future. Therefore although sometimes a reference will be made to these options, these will not be described in detail yet.

That applies in particular to the following subjects:

- —-
- —-

1.2 Other system documents

The full documentation on the program comprises the following documents.

Title	Content
DAM Architecture Overall (The, 2017a)	Description of overall architecture of DAM and its components.
DAMLive- Technical Design (The, 2017b)	Description of the implementation of the technical design of DAM Engine.
DAM Engine - Technical documentation (Doxygen, 2017)	Description of the arguments and usage of different software components, generated from in-line comment with Doxygen.
DAM UI - Functional Design (Zwan, 2017b)	Description of the requirements and functional design.
Architecture Guidelines (Kleijn *et al.*, 2017)	Architecture guidelines that are used by DSC-Deltares.

Table 1.1: *DAMLive system documents.*

1.3 Document revisions

1.3.1 Revision 0.1

First concept of the document.

2 Functional requirements

Main purpose of DAMLive DAMLive can combine a dam project with sensor data to calculation input for the DAM Engine. After calculations made by DAM Engine DAMLive can produce an output files with results.

2.1 REQ Data.Input

DAMLive needs a DAM project file (*.damx) and sensordata. The generation of the DAM project file is described in the Functional Design of DAM UI, see (Zwan, 2017b). In this DAM project information about the sensors is present; where are the sensors placed and for which PL-line is the data used.

The sensordata itself must be provided in xml format. This is described in the FEWS Public Wiki

2.2 REQ Calc.Settings

DAMLive can use the kernels which are used by DAM Engine. Via a xml file ables DAMLive the user to change calculations settings such as failure mechanisms (kernel) and models. The available failure mechanisms and models are described in the Functional Design of DAM Engine (Zwan, 2017a).

2.3 REQ Data.Output

DAMLive can produce output files.

2.4 REQ Save.Project

The DAMLive can save a project.

3 Calculation Parameters

3.1 DamLiveCalculationParameters.xsd

This is the XML schema file for the calculation parameters file.

```
<?xml version="1.0" encoding="utf-8"?>
<!-- Created with Liquid XML Studio 1.0.8.0 (http://www.liquid-technologies.com) -->
<xs:schema xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" attributeFormDefault="unqualified
  <xs:element name="CalculationParameters">
    <xs:complexType>
      <xs:sequence>
        <xs:element minOccurs="0" name="CalculationModules">
          <xs:complexType>
            <xs:sequence>
              <xs:element minOccurs="0" maxOccurs="1" name="StabilityInside" type="xs:boolean" />
              <xs:element minOccurs="0" maxOccurs="1" name="StabilityOutside" type="xs:boolean" />
              <xs:element minOccurs="0" maxOccurs="1" name="PipingWti" type="xs:boolean" />
              <xs:element minOccurs="0" maxOccurs="1" name="PipingBligh" type="xs:boolean" />
              <xs:element minOccurs="0" maxOccurs="1" name="PipingSellmeijer" type="xs:boolean" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element minOccurs="0" name="MStabParameters">
          <xs:complexType>
            <xs:sequence>
              <xs:element minOccurs="0" maxOccurs="1" name="IsCalculateAllStabilityProjectsAtOnce"
              <xs:element minOccurs="0" maxOccurs="1" name="CalculationModel">
                <xs:simpleType>
                  <xs:restriction base="xs:string">
                    <xs:enumeration value="Bishop" />
                    <xs:enumeration value="Spencer" />
                    <xs:enumeration value="Fellenius" />
                    <xs:enumeration value="UpliftVan" />
                    <xs:enumeration value="UpliftSpencer" />
                    <xs:enumeration value="BishopRandomField" />
                    <xs:enumeration value="HorizontalBalance" />
                    <xs:enumeration value="BishopUpliftVan" />
                    <xs:enumeration value="SpencerHigh" />
                    <xs:enumeration value="SpencerLow" />
                  </xs:restriction>
                </xs:simpleType>
              </xs:element>
              <xs:element minOccurs="0" maxOccurs="1" name="SearchMethod">
                <xs:simpleType>
                  <xs:restriction base="xs:string">
                    <xs:enumeration value="Grid" />
                    <xs:enumeration value="GeneticAlgorithm" />
                  </xs:restriction>
                </xs:simpleType>
              </xs:element>
              <xs:element minOccurs="0" maxOccurs="1" name="UseZones" type="xs:boolean" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

4 Literature

Doxygen, 2017. *DAM Engine - Technical documentation, Generated by Doxygen 1.8.10*. Tech. rep., Deltares.

Kleijn, E., A. Grijze, H. Elzinga, S. Hummel and T. The, 2017. *Architecture Guidelines*. Tech. rep., Deltares.

The, T., 2017a. *DAM Architecture Overall*. Tech. Rep. 1210702-000-GEO-0005, version 0.1, jan. 2017, concept, Deltares.

The, T., 2017b. *DAM Engine - Technical Design*. Tech. Rep. 1210702-000-GEO-0004, version 0.2, mar. 2017, concept, Deltares.

Zwan, I. v., 2017a. *DAM Engine - Functional Design*. Tech. Rep. 1210702-000-GEO-0003, version 0.1, jan. 2017, concept, Deltares.

Zwan, I. v., 2017b. *DAM UI - Functional design*. Tech. Rep. 1207094-000-GEO-0005, Versie 2, 11 juni 2013, concept, Deltares.

Appendix

A Sensor Data format