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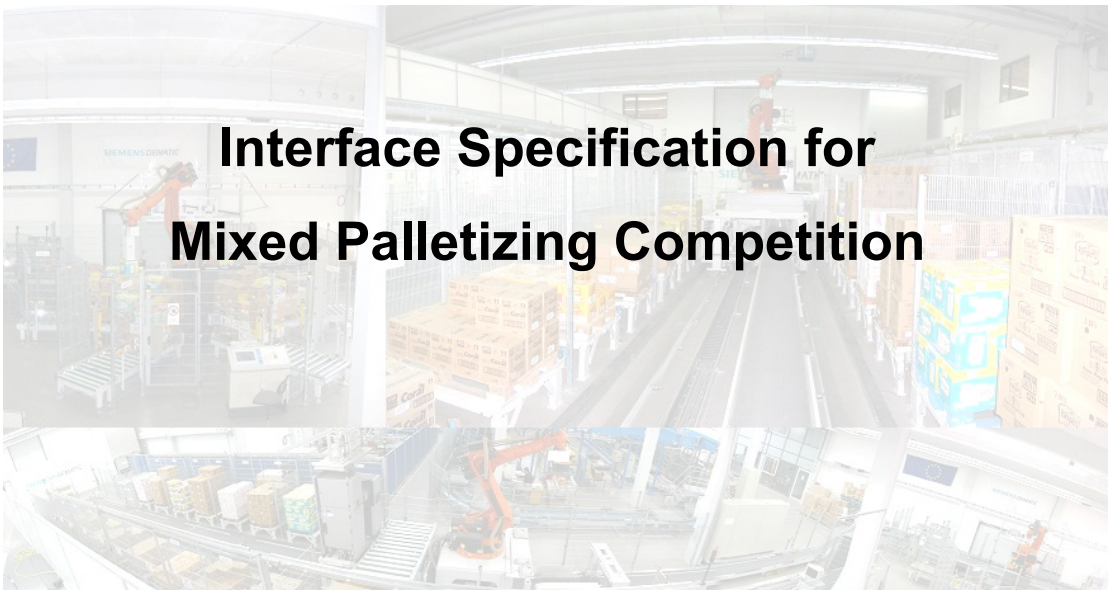

Interface Specification for Mixed Palletizing Competition

KUKA

Logistics Group

Contact: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

KUKA

Document History

Version	Date	Author	Modification
01	2/16/2010	Dr. Christian Wurll	Creation

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

KUKA

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Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

1 Introduction

1.1 Objective

This documentation is describing the hardware and software setup of the Mixed Case Palletizing development and demonstration cell which will be finally located at the Robotics Institute of the College of Computing at GeorgiaTech.

This demonstration cell will be displayed by KUKA Systems North America on the trade fair show “NA 2010” in Cleveland, OH (April 26-29, 2010) and will then continue to the 2010 IEEE International Conference on Robotics and Automation (ICRA 2010) in Anchorage, Alaska (May 3-8, 2010).

At the ICRA the cell is part of the ”Virtual Manufacturing Competition Challenge”. All participating University teams can run their results finally on a real robot to see whether their calculations lead to a stable and dense mixed pallet. Further information about this competition can be found at http://www.vma-competition.com.

To provide an objective benchmark all participating teams have to calculate mixed pallets for the included “real” customer orders, which are described in Chapter 4.

1.2 Terms and Definitions

Terms	Description
Family Grouping	Specifies the grouping of all cases according to its product family. E.g. all cases belonging into the same super market aisle shall be grouped together on one pallet.
Fragility Class	Classification of all cases according to its packaging stability
KRC	KUKA Robot Controller
Order	Palletizing Order from the WMS The order contains a list of cases with different dimensions and quantities. The mixed palletizing software converts this order into a Packlist.
Packlist	List of pallet pattern describing the stacking of one or more mixed pallets. For each pallet the list contains the case sequence, the 3D positions on the pallet and collision-free approach points.
Ranking	Grouping of cases according to its fragility class. In order to achieve a stable pallet, the most stable cases should be located on the bottom and the most instable cases on the top of the pallet.
SKU	Stock Keeping Unit: An individual article

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Tray	Card board or plastic container holding cans or bottles. A tray can either be open or shrink wrapped.
WMS	Warehouse Management System Software System which is managing the inventory of the distribution center and is dispatching the work to the automation system or human workers

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

2 System Description

2.1 Layout

The system layout of the mixed case palletizing cell is shown in Figure 1.

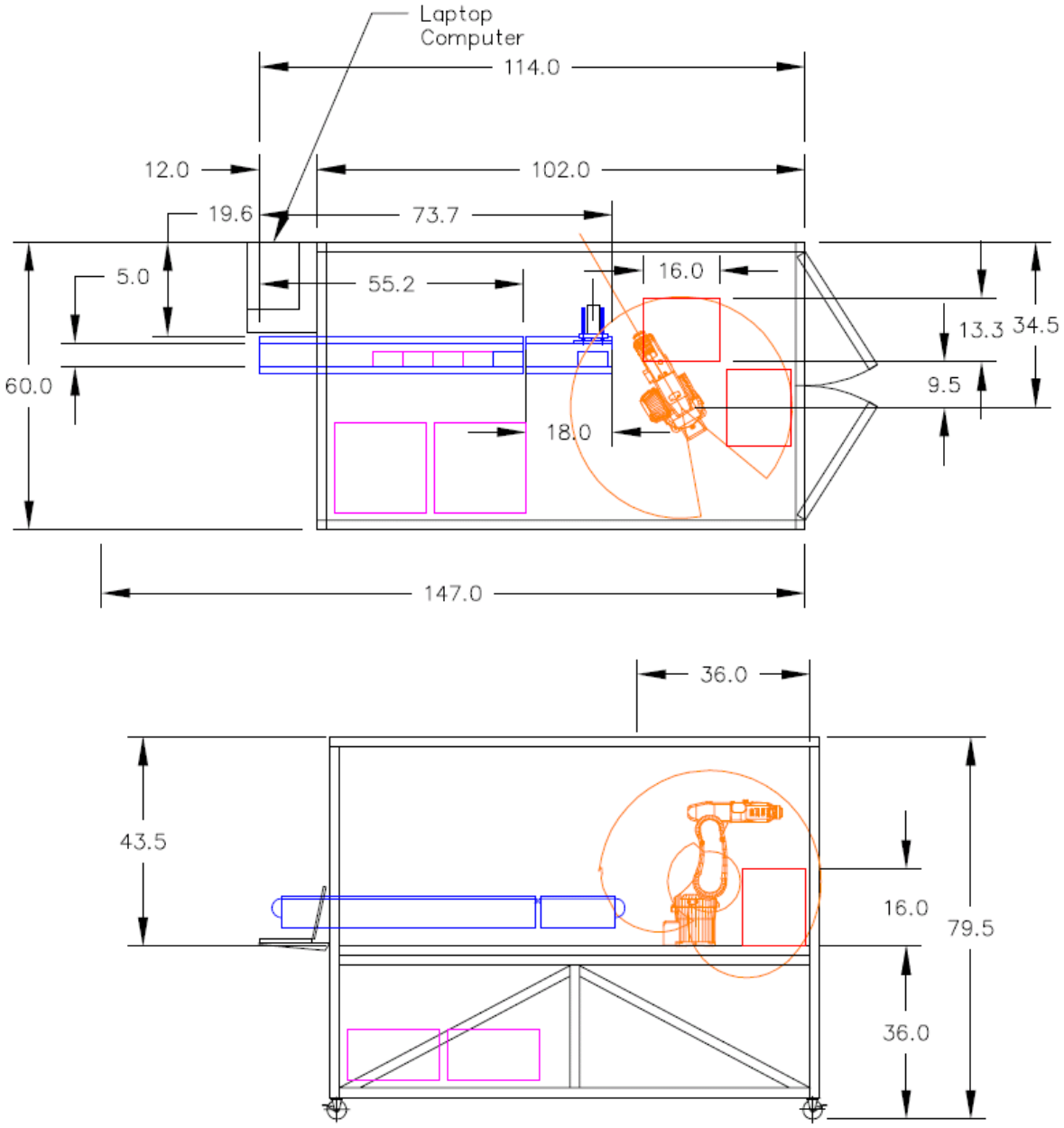


Figure 1: Layout of the Mixed Case Palletizing Cell in the top and side view.

The cell consists of a KUKA Robot KR 5Six W650 which is equipped with simple vacuum gripper. Cases are placed manually onto a conveyor at the left side of the cell. They are conveyed towards the robot and aligned to one side to ensure a known pick up position. There are two possible target pallet positions where a mixed pallet can be build.

The whole cell is surrounded by Plexiglas windows to guarantee the required safety regulations. Underneath the robot plate the robot controller is located.

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Close to the case infeed position is a mounting plate for a laptop which runs the robot cell control software KUKA.PickControl. This application is able to read in the mixed pallet pattern (Packlist.xml ➔ see Section 3.3) and displays the mixed pallet pattern in 3D and instructs the operator which case needs to be placed onto the conveyor.

The whole cell layout is a scaled down version of a real robotic cell. The used scale is 1:3. Thus a normal US pallet with a size of 48 x 40” is scaled down to 16 x 13.3” or 406 x 339mm. The maximum load height is typically 65 – 72”, but due to the limited reach of the robot, the maximum height is reduced to “real” 48” or 16” or 406 mm in the reduced scale.

2.2 Mixed Pallets

Mixed case palletizing is basically applied in every distribution center. Depending on the customer order lines, the distribution center is shipping full pallets or custom build order pallets. Mixed order pallets can be grouped into the following four categories:

1. Rainbow pallets: Pallets containing 2 or more SKUs where each SKU is ordered in one ore more layer quantities
2. Mixed layers: Pallets containing 2 or more SKUs where different SKUs can be combined into a mixed layer since the package type is the same or the cases heights are in the same range
3. Mixed pallets: Pallets containing usually 25 or more SKUs which have different package dimensions and cannot be combined into full or mixed layers
4. Hybrid pallets: Pallets containing at least two different of the first three categories.

The customer’s SKU proliferation and order line characteristics is the main driving factor to which category an order pallet belongs to.

A beverage manufacturer has usually 300 – 800 different SKUs and a very steep Pareto curve (Figure 2).

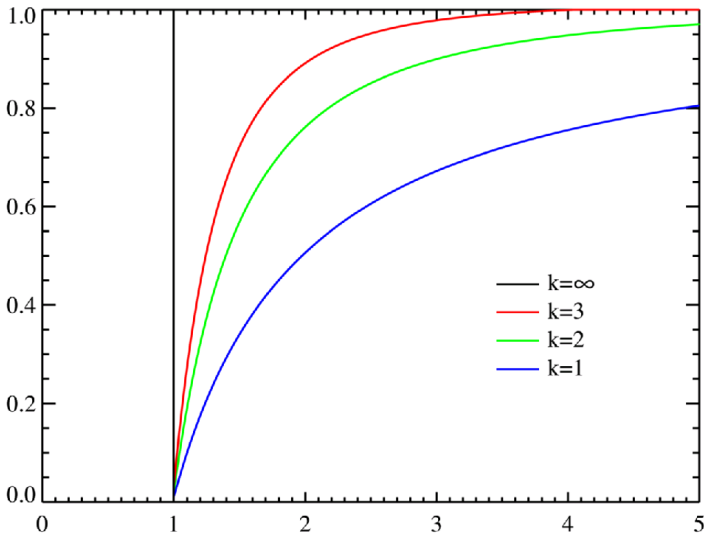


Figure 2: Pareto cumulative distribution functions for various α *with* x_m *= 1. The horizontal axis is the* x *parameter [http://en.wikipedia.org/wiki/Pareto_distribution]*

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Usually the order volume follows the “80-20 rule”, which means that with 20% of its products the manufacturer is generating 80% of its turn over.

A food distribution center has usually 4000 – 10,000 different SKUs and a less steep Pareto curve. That means, a food distribution center has to touch more SKUs to generate e.g. 80% of its turn over.

2.3 Test blocks

For the mixed palletizing competition, two different sets of test blocks are available to execute the calculated mixed palletizing results of every participant. In Chapter 4, different order examples are explained in detail.

The two sets represent “real” product dimensions, which are scaled down accordingly.

2.3.1 Beverage Industry

The beverage block set consists of 8 different package types.

No.	Package Code	Package Name	Length [mm]	Width [mm]	Height [mm]	Blocks Required
1	843	12OZ CN 24/1CB	90	67	82	40
2	1261	12OZ CN 8/3 FM	89	43	41	60
3	1128	12OZ CN 12/2 FM	131	43	41	40
4	1459	12OZ CN 18/1 FM	131	66	41	24
5	735	20OZ PL 1/24S	159	106	75	16
6	1098	16.9OZ PL 24/1	144	95	74	20
7	810	1L PL BS 1/15S	159	95	93	18
8	455	2L PL 1/8S	161	80	110	20
		Min	89	43	41	238
		Average	133	74	70	Sum
		Max	161	106	110	

2.3.2 Food Industry

The food block set consists of 112 different SKUs which can be grouped into 51 different package type categories.

No.	Part #	Package Code	Length [mm]	Width [mm]	Height [mm]	Quantity
1	11343	100-70-50	100	70	50	6
2	11346	100-70-50	100	70	50	6
3	11350	100-70-50	100	70	50	6
4	11365	100-70-50	100	70	50	6
5	11401	100-70-50	100	70	50	6
6	12280	100-70-53	100	70	53	3
7	12282	100-70-53	100	70	53	3
8	12286	100-70-53	100	70	53	3
9	11601	100-70-63	100	70	63	5
10	11204	100-70-67	100	70	67	4
11	66022	100-73-50	100	73	50	3
12	13221	103-53-47	103	53	47	3
13	30275	103-53-47	103	53	47	3
14	30276	103-53-47	103	53	47	3
15	11620	103-57-47	103	57	47	8

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

16	11681	103-57-47	103	57	47	8
17	15168	103-70-63	103	70	63	3
18	15167	103-70-63	103	70	63	3
19	15180	103-70-63	103	70	63	3
20	62435	103-80-63	103	80	63	2
21	62436	103-80-63	103	80	63	2
22	13214	107-55-47	107	55	47	4
23	14101	107-55-47	107	55	47	4
24	14103	107-55-47	107	55	47	4
25	15223	107-55-47	107	55	47	4
26	15224	107-55-47	107	55	47	4
27	15226	107-55-47	107	55	47	4
28	15227	107-55-47	107	55	47	4
29	15316	107-57-47	107	57	47	2
30	15317	107-57-47	107	57	47	2
31	15325	107-57-47	107	57	47	2
32	15411	107-57-47	107	57	47	2
33	15420	107-57-47	107	57	47	2
34	15602	107-57-47	107	57	47	2
35	15626	107-57-47	107	57	47	2
36	16602	107-57-47	107	57	47	2
37	62439	110-60-43	110	60	43	2
38	62441	110-60-43	110	60	43	2
39	62443	110-60-43	110	60	43	2
40	62406	110-60-47	110	60	47	3
41	40022	110-87-70	110	87	70	9
42	30214	113-77-37	113	77	37	3
43	60020	120-80-53	120	80	53	7
44	60008	120-80-57	120	80	57	2
45	60021	120-80-57	120	80	57	2
46	70012	120-80-57	120	80	57	2
47	80035	120-80-57	120	80	57	2
48	30643	120-90-63	120	90	63	2
49	30644	120-90-63	120	90	63	2
50	30403	123-90-87	123	90	87	3
51	30414	123-90-87	123	90	87	3
52	30415	123-90-87	123	90	87	3
53	49572	123-90-87	123	90	87	3
54	30429	123-90-97	123	90	97	3
55	30430	123-90-97	123	90	97	2
56	30431	123-90-97	123	90	97	2
57	11644	127-63-67	127	63	67	4
58	30460	133-117-53	133	117	53	10
59	25669	140-103-80	140	103	80	6
60	25672	140-103-80	140	103	80	6
61	25673	140-103-80	140	103	80	6
62	13232	140-103-83	140	103	83	12
63	24043	140-107-53	140	107	53	8
64	11623	140-110-53	140	110	53	2
65	11252	140-110-57	140	110	57	2
66	11254	140-110-57	140	110	57	2
67	25633	143-100-67	143	100	67	3
68	25635	143-100-67	143	100	67	3

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

69	30289	143-100-67	143	100	67	3
70	30285	143-100-80	143	100	80	2
71	30286	143-100-80	143	100	80	2
72	30287	143-100-80	143	100	80	2
73	11292	143-110-53	143	110	53	3
74	63004	147-80-47	147	80	47	4
75	63044	147-80-47	147	80	47	2
76	52060	147-90-70	147	90	70	2
77	52061	147-90-70	147	90	70	2
78	30435	157-113-77	157	113	77	3
79	51830	157-87-83	157	87	83	2
80	30419	160-108-100	160	108	100	3
81	30420	160-108-100	160	108	100	3
82	30421	160-108-100	160	108	100	3
83	30422	160-108-100	160	108	100	3
84	50005	160-47-40	160	47	40	5
85	30406	167-110-43	167	110	43	3
86	30404	167-110-47	167	110	47	3
87	30405	167-110-47	167	110	47	3
88	30407	167-110-47	167	110	47	3
89	30410	167-110-47	167	110	47	3
90	30466	167-117-53	167	117	53	3
91	30591	167-117-53	167	117	53	3
92	63047	180-97-47	180	97	47	3
93	11210	193-53-87	193	53	87	3
94	52187	193-93-47	193	93	47	3
95	11293	200-53-57	200	53	57	4
96	30398	223-90-47	223	90	47	2
97	30399	223-90-47	223	90	47	2
98	15192	60-40-40	60	40	40	6
99	63204	80-77-77	80	77	77	2
100	63208	80-77-77	80	77	77	2
101	54925	85-57-37	85	57	37	3
102	30210	90-67-53	90	67	53	3
103	25680	90-70-60	90	70	60	4
104	25681	90-70-60	90	70	60	4
105	25685	90-70-60	90	70	60	4
106	25686	90-70-60	90	70	60	3
107	15190	93-60-37	93	60	37	2
108	15191	93-60-37	93	60	37	2
109	54141	93-80-40	93	80	40	3
110	54176	93-80-40	93	80	40	3
111	54321	93-80-40	93	80	40	3
112	54581	93-80-40	93	80	40	3
	Min		60	40	37	385
	Avg		124	80	59	Sum
	Max		223	117	100	

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

3 Software Description

3.1 Overview

The robot control software KUKA.PickControl is able to read in the output file of the mixed palletizing software and converts this file into individual robot movements.

For a collision free pallet building it is necessary to specify additional approach points beside the final place position.

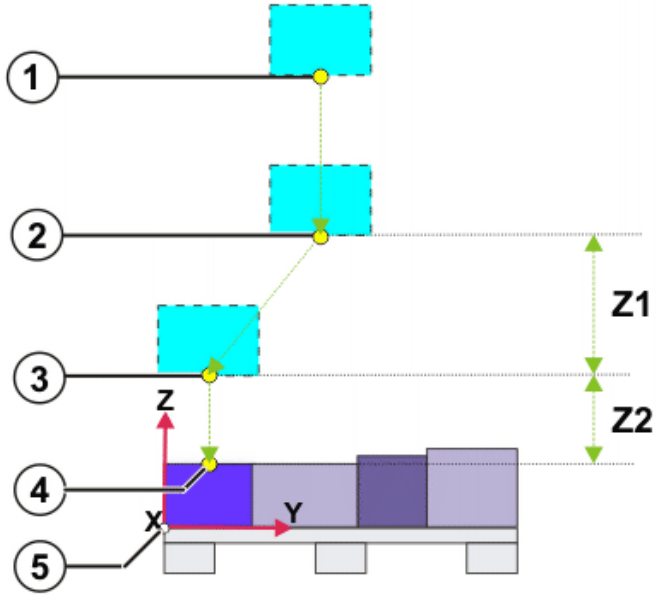


Figure 3: Definition of the approach points and coordinate system

1	Approach position 1
2	Approach position 2
3	Approach position 3
4	Final place position
5	Pallet coordinate system
X	X-Axis along the long side of the pallet
Y	Y-Axis along the short side of the pallet
Z1	Distance between the approach point 2 and 3
Z2	Distance between the approach point 3 and the final place position

In Figure 4 the pallet coordinate system and a typical pallet overhang is defined. The X-Axis is usually along the longer side of the pallet.

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

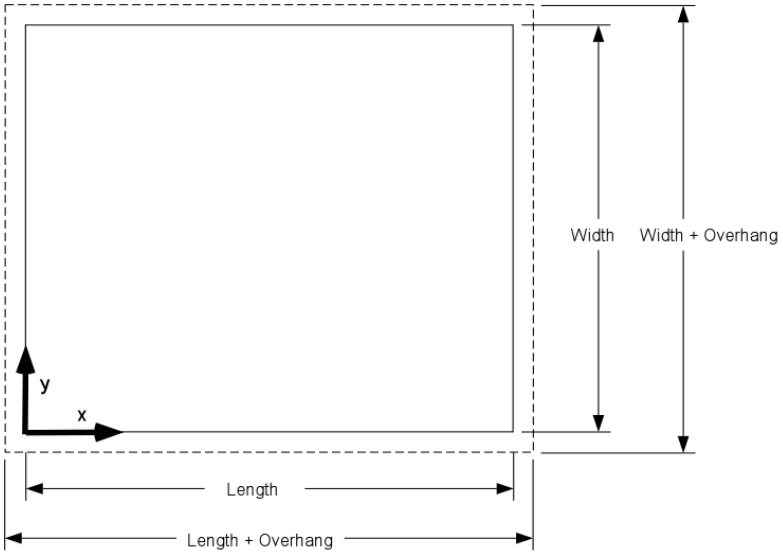


Figure 4: Pallet Coordinate System and Overhang definition

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

3.2 Input File: Order File

3.2.1 Overview

The order.xml file contains the following data:

- Initialization parameters for the pallets: <PalletInit>…</PalletInit>
- Order data: <Order> … </Order>
    - Order Number and definition of product grouping
    - List of all ordered articles with article parameters and corresponding barcodes

Example:

```
<Message index="1">
   <PalletInit>
      <Pallets>
         <Pallet>
            <PalletNumber>1</PalletNumber>
            <Description>Euro Pallet</Description>
            <Dimensions>
               <Length>940</Length>
               <Width>940</Width>
               <MaxLoadHeight>1700</MaxLoadHeight>
               <MaxLoadWeight>1000000</MaxLoadWeight>
            </Dimensions>
            <Overhang>
               <Length>26</Length>
               <Width>26</Width>
            </Overhang>
            <SecurityMargins>
               <Length>0</Length>
               <Width>0</Width>
            </SecurityMargins>
         </Pallet>
      </Pallets>
   </PalletInit>
   <Order>
      <ID>00011380</ID>
      <Description />
      <Restrictions>
         <FamilyGrouping>False</FamilyGrouping>
         <Ranking>False</Ranking>
      </Restrictions>
      <OrderLines>
         <OrderLine>
            <OrderLineNo>1</OrderLineNo>
            <Article>
               <ID>11</ID>
               <Description>20oz PET Singles</Description>
               <Type>1</Type>
               <Length>470</Length>
               <Width>311</Width>
               <Height>241</Height>
               <Weight>16000</Weight>
               <Family>4</Family>
            </Article>
            <Barcodes>
               <Barcode>110001</Barcode>
               <Barcode>110002</Barcode>
            </Barcodes>
         </OrderLine>
         <OrderLine>
            <OrderLineNo>2</OrderLineNo>
            ...
         </OrderLine>
      </OrderLines>
   </Order>
</Message>
```


Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Pallet Init: <PalletInit> … </PalletInit>

Parameter	Description
Pallet Number	Pallet number
Description	Name of the pallet, e.g. “Euro Pallet”, CHEP Pallet, US Pallet, etc.

Pallet dimension: <Dimensions> … </Dimension

Parameter	Description
Length	Length of the pallet in X direction in [mm]
Width	Width of the pallet in Y direction in [mm]
MaxLoadHeight	Maximum load height of the pallet in Z direction in [mm]
MaxLoadWeight	Maximum weight of the pallet in [g]

Overhang: <Overhang> … </Overhang>

Parameter	Description
Length	Allowed overhang along the length side in X direction in [mm]
Width	Allowed overhang along the width side in Y direction in [mm]

SecurityMargin: <SecurityMargin> … </SecutiryMargin>

Parameter	Description
Length	Safety distance between the cases along the length side in X direction in [mm]
Width	Safety distance between the cases along the width side in Y direction in [mm]

Order Data: <Order> … </Order>

Parameter	Description
ID	Unique Order ID

Article Grouping: <Restrictions> … </Restrictions>

Parameter	Description
Family Grouping	Family grouping enabled (True) or disabled (False) Default: False
Ranking	Ranking enabled (True) or disabled (False) Default: False

Order Line: <OrderLine> … </OrderLine>

Parameter	Description
OrderLineNo	Incrementing number for each order line

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Article Data: <Article> … </Article>

Parameter	Description	
ID	Unique identifier of the article	
Description	Name of the article	
Type	Packaging Type: • 1: Square box Currently only value 1 is allowed	
Length	Length of the case in [mm]	Length x Width are specifying the bottom of the case. The length value should be larger than the width value
Width	Width of the case in [mm]	
Height	Height of the case in [mm]	
Weight	Weight of the case in [g]	
Family	Number of the family group to which this case belongs to. Only relevant if Parameter <FamilyGrouping> was set to True.	

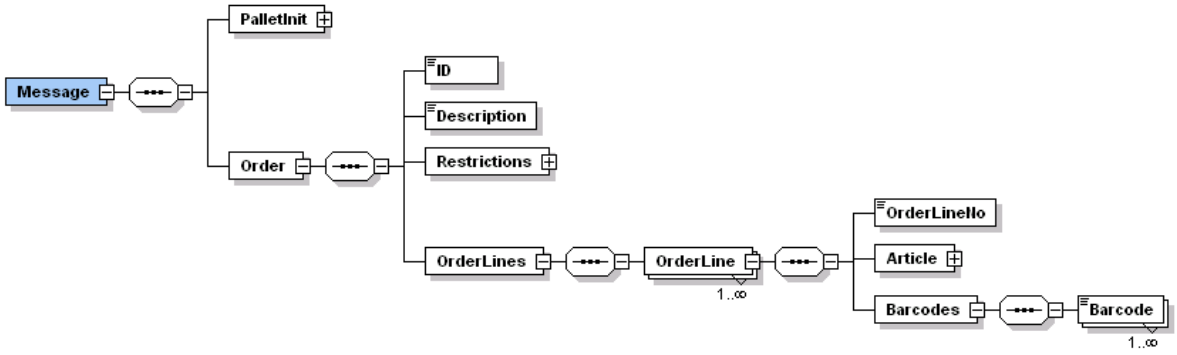
Data about potential sub units in a case: <Barcodes> … </Barcodes>

Parameter	Description
Barcode	Barcode The number of barcodes corresponds to the number of ordered cases.

3.2.2 Schema File

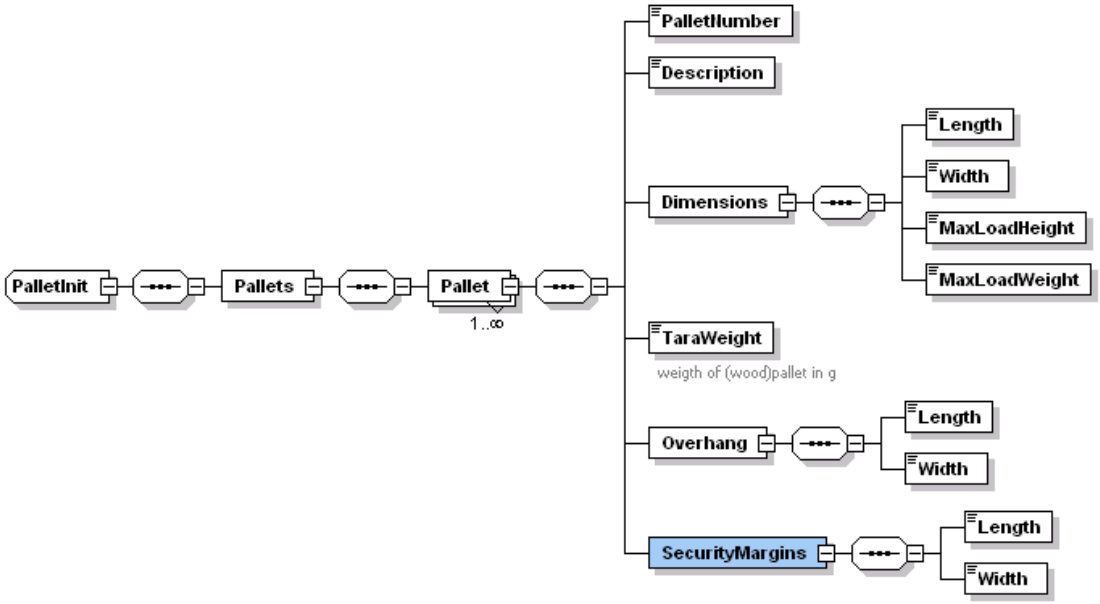
The input file is described in a set of schema files in order to check the format on correctness.

OffLineMessage.xsd

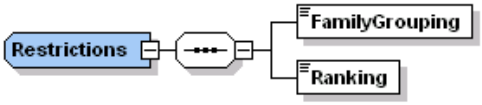


Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

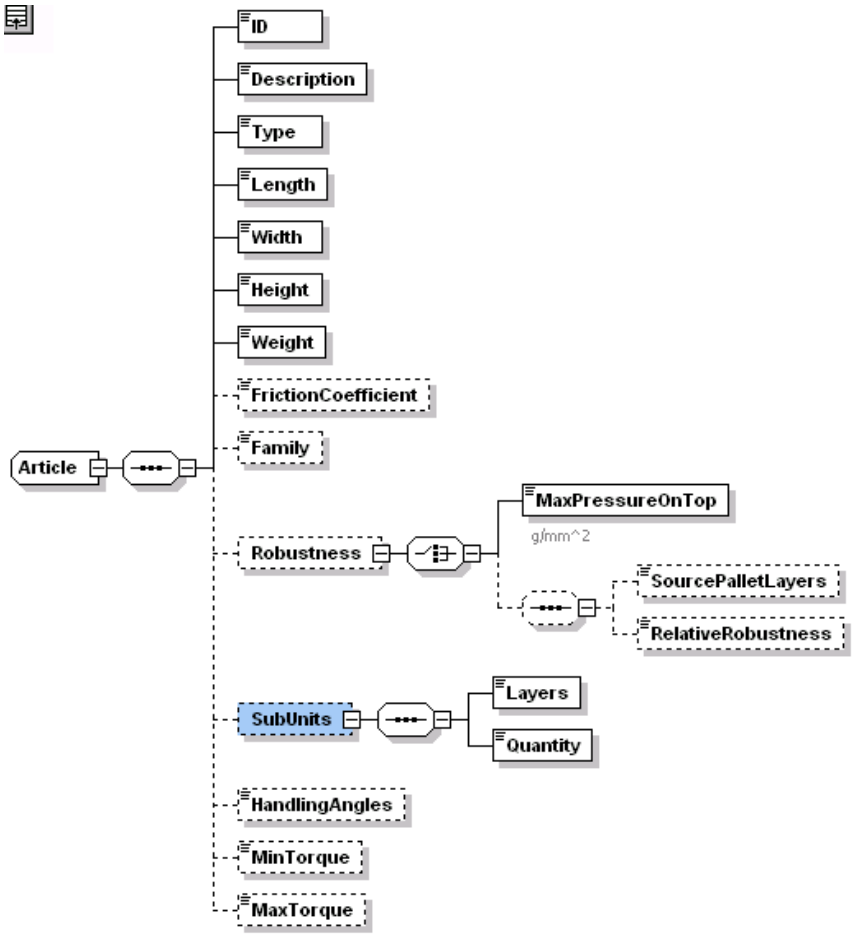
PalletInit.xsd



Restrictions.xsd



Article.xsd



Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

3.3 Output File: Packlist File

3.3.1 Overview

The mixed palletizing software has to calculate the stacking sequence, the placement coordinates and three collision free approach points for each ordered case. Depending on the order volume the software may stack the cases on more than one pallet.

```
<Response>
   <PackList>
      <OrderID>00011380</OrderID>
      <PackPallets>
         <PackPallet>
            <PalletNumber>1</PalletNumber>
            <Description>EuroPallet</Description>
            <Dimensions>
               <Length>940</Length>
               <Width>940</Width>
               <MaxLoadHeight>1700</MaxLoadHeight>
               <MaxLoadWeight>1000000</MaxLoadWeight>
            </Dimensions>
            <Packages>
               <Package>
                  <PackSequence>1</PackSequence>
                  <IncomingSequence>1</IncomingSequence>
                  <OrderLineNo>5</OrderLineNo>
                  <ParentLayer>0</ParentLayer>
                  <Article>
                     <ID>146</ID>
                     <Description>12oz 12pk FM</Description>
                     <Type>1</Type>
                     <Length>398</Length>
                     <Width>132</Width>
                     <Height>124</Height>
                     <Weight>5000</Weight>
                     <Family>1</Family>
                     <Rank>1</Rank>
                     <MaxRankOnTop>1</MaxRankOnTop>
                     <HandlingAngles>All</HandlingAngles>
                     <MinTorque>10</MinTorque>
                     <MaxTorque>100</MaxTorque>
                  </Article>
                  <Barcode>1460002</Barcode>
                  <PlacePosition>
                     <X>767</X>
                     <Y>900</Y>
                     <Z>124</Z>
                  </PlacePosition>
                  <Orientation>1</Orientation>
                  <ApproachPoint1>
                     <X>60</X>
                     <Y>-60</Y>
                     <Z>50</Z>
                  </ApproachPoint1>
                  <ApproachPoint2>
                     <X>60</X>
                     <Y>-60</Y>
                     <Z>50</Z>
                  </ApproachPoint2>
                  <ApproachPoint3>
                     <X>0</X>
                     <Y>0</Y>
                     <Z>3</Z>
                  </ApproachPoint3>
                  <StackHeightBefore>0</StackHeightBefore>
               </Package>
               <Package>
                  <PackSequence>2</PackSequence>
                  ...
               </Package>
            </Packages>
         </PackPallet>
      </PackPallets>
   </PackList>
</Response>
```


Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Order Data: <PackList> … </PackList>

Parameter	Description
OrderID	Unique order number extracted from the ORDER.XML file

Pallet Data:

Parameter	Description
Pallet Number	Pallet number
Description	Name of the pallet, e.g. “Euro Pallet”, CHEP Pallet, US Pallet, etc.

Pallet dimension: <Dimensions> … </Dimension

Parameter	Description
Length	Length of the pallet in X direction in [mm]
Width	Width of the pallet in Y direction in [mm]
MaxLoadHeight	Maximum load height of the pallet in Z direction in [mm]
MaxLoadWeight	Maximum weight of the pallet in [g]

Package Data:

Parameter	Description
PackSequence	Sequence number in which the package has to placed on to the pallet
IncomingSequence	Sequence number in with the package has to be conveyed into the cell Note: In the offline mixed palletizing environment the PackSequence and the IncomingSequence have to be identical
OrderLineNo	Unique number extracted from the ORDER.XML file
ParentLayer	Layer number of the pallet on which the package will be placed to

Article Data: <Article> … </Article>

Parameter	Description
ID	Unique identifier of the article
Description	Name of the article
Type	Packaging Type: • 1: Square box Currently only value 1 is allowed
Length	Length of the case in [mm]
Width	Width of the case in [mm]
Height	Height of the case in [mm]

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

Weight	Weight of the case in [g]
Family	Number of the family group to which this case belongs to. Only relevant if Parameter <FamilyGrouping> was set to True.
Rank	Number of the fragility class to which this case belongs to. Only relevant if Parameter <Ranking> was set to True.
MaxRankOnTop	Specifies the maximum rank class of cases, which can be placed on top of this case
HandlingAngles	Allowed gripper orientation during the pick up on the conveyor. Default: All
MinTorque	Not used
MaxTorque	Not used

Parameter	Description
Barcode	Barcode of the case extracted from the ORDER.XML file.

Approach Strategy:

Parameter	Description
PlacePosition	Final place position of the case on the pallet • X: Position in X direction of the pallet • Y: Position in Y direction of the pallet • Z: Position in Z direction of the pallet All units are in [mm]
Orientation	Orientation of the case on the pallet in reference to the pallet coordinate system: • 1: 0°; the long side of the case is parallel to the X direction of the coordinate system • 2: 90°; the long side of the case is parallel to the Y direction of the coordinate system

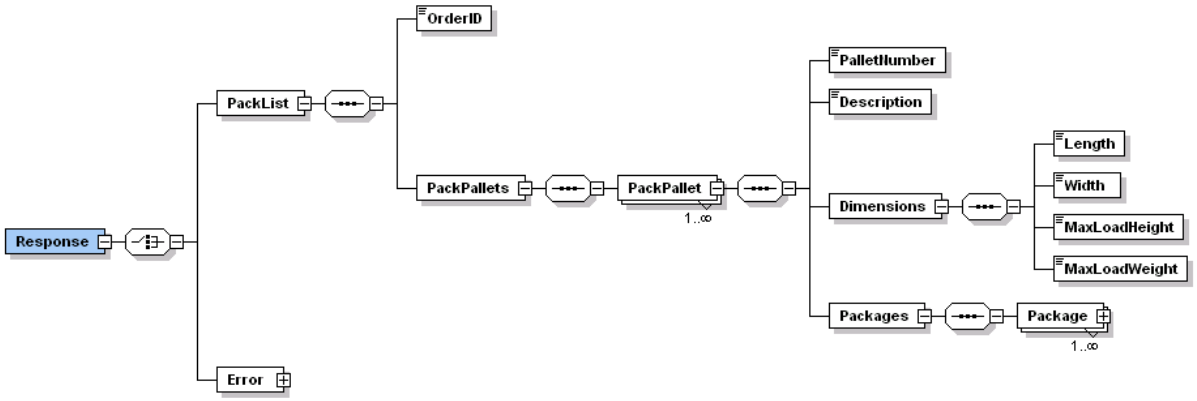
Parameter	Description
ApproachPoint1 … ApproachPoint3	Approach position above the pallet. The coordinates of the approach points are relative to the place positions on the pallet • X: Relative position in X-direction • Y: Relative position in Y-direction

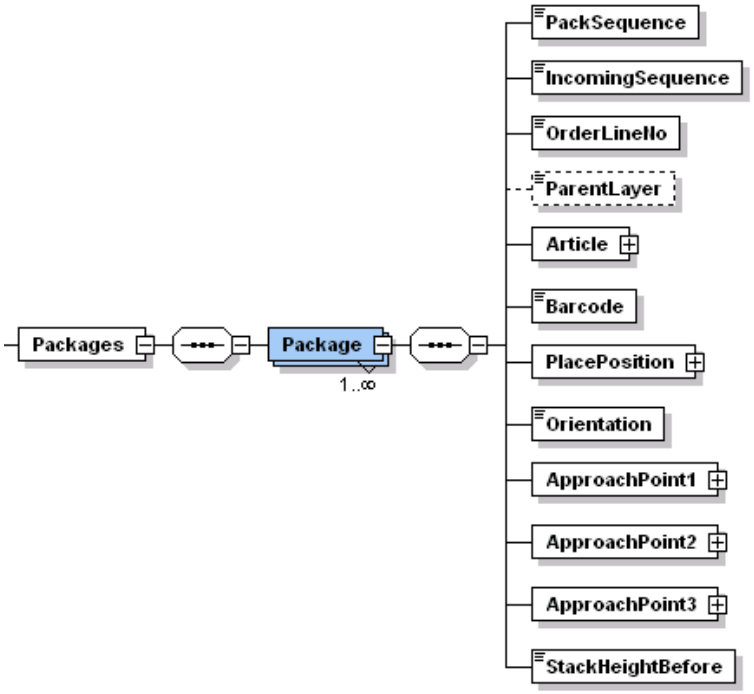
Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

	• Z: Relative position in Z-direction
StackHeightBefore	Highest Point on the pallet before placing the current case

3.3.2 Schema Files

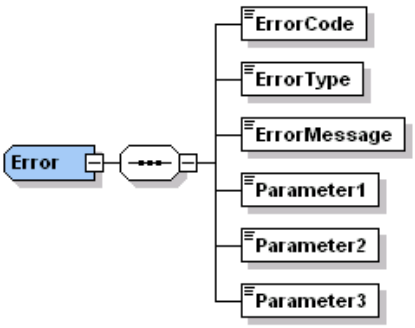
OffLineResponse.xsd



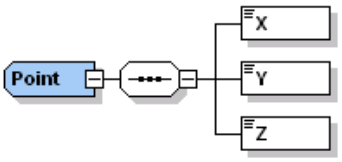


Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

OffLineResponse.xsd



Point.xsd



Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

4 Example Orders

4.1 Overview

In the following paragraphs different examples for the beverage and food industry are summarized and explained in detail.

The shown pallets are calculated with a mixed palletizing algorithm without optimizing any industry specific parameters. The shown results are not optimal solutions but shall give a rough guideline what the orders look like.

4.2 Beverage Industry

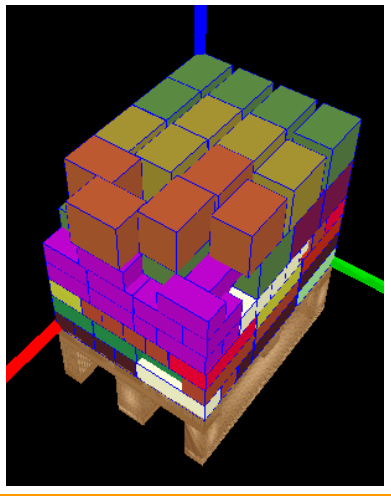
The beverage example pallets are using the block set “Beverage”. The following three orders are defined:

1. Small sized order which should fit onto one pallet
2. Medium sized order which should fit onto 2 – 3 pallets
3. Large sized order which should fit into onto 5 – 6 pallets
4. Medium sized order which fits onto 2 – 3 CooLift Pallets)

Orders #1 - #3 are using a “Beverage” Pallet which has a size of 48x36” in the real world. Order #4 is using a “CooLift” Pallet which 42x18.5” large. This pallet type was introduced by one US soft drink producer to change the front door delivery. Further information about the CooLift pallet can be found at http://swiftwaterlogistics.com/coolift.html.

4.2.1 Beverage_001.xml

This order consists of 16 order lines with 124 cases in total distributed over 16 different SKUs.

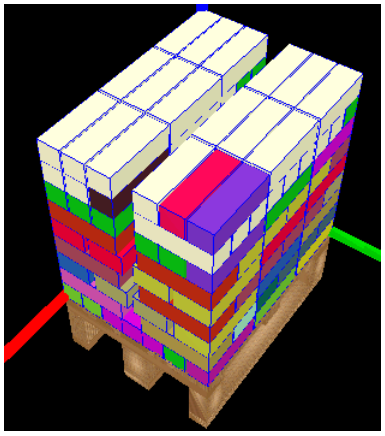
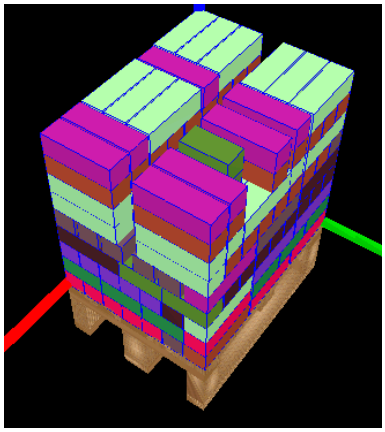
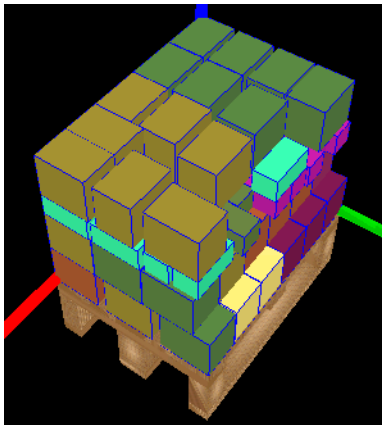


Pallet #1

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

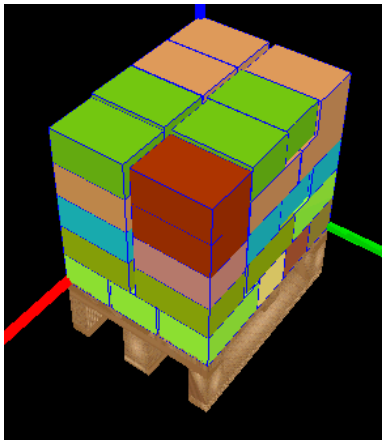
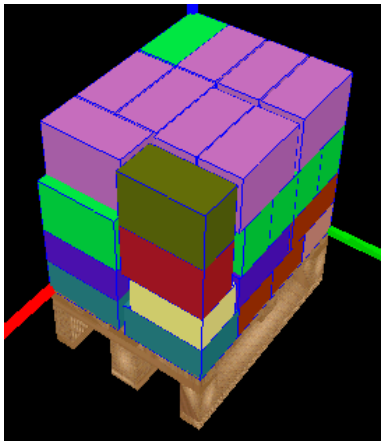
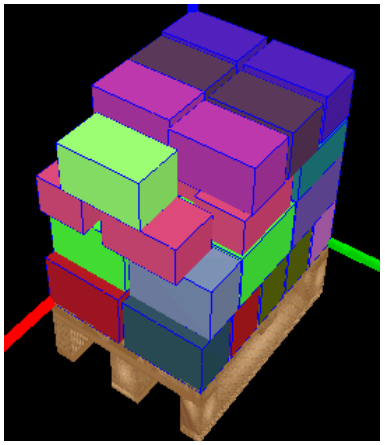
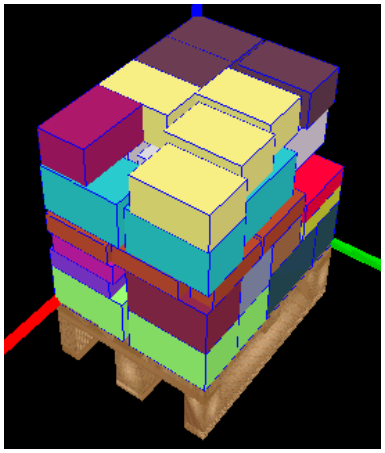
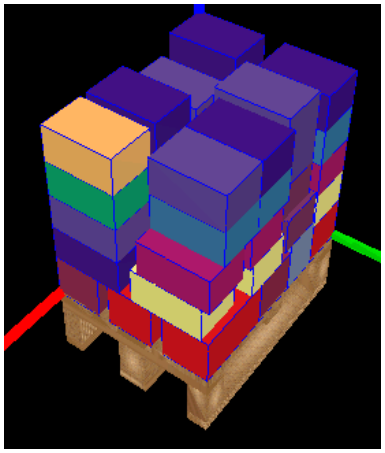
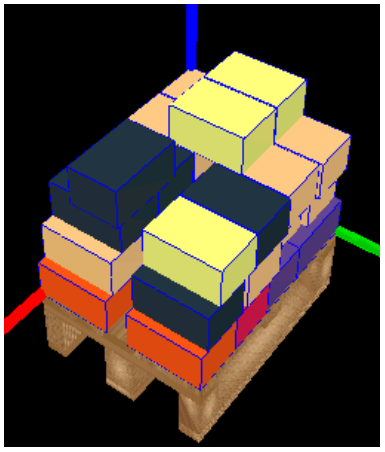
4.2.2 Beverage_002.xml

This order consists of 41 order lines with 386 cases in total distributed over 41 different SKUs.

		
Pallet #1	Pallet #2	Pallet #3

4.2.3 Beverage_003.xml

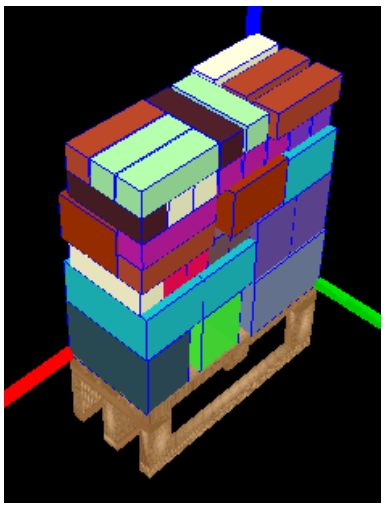
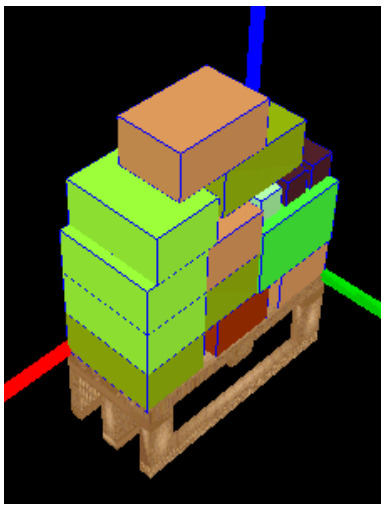
This order consists of 60 order lines with 247 cases in total distributed over 41 different SKUs.

		
Pallet #1	Pallet #2	Pallet #3
		
Pallet #4	Pallet #5	Pallet #6

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

4.2.4 Beverage_004.xml

This order consists of 17 order lines with 49 cases in total distributed over 17 different SKUs. CooLift orders are in general smaller orders since they are delivered front door e.g. to gas stations or convenience stores.

	
Pallet #1	Pallet #2

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

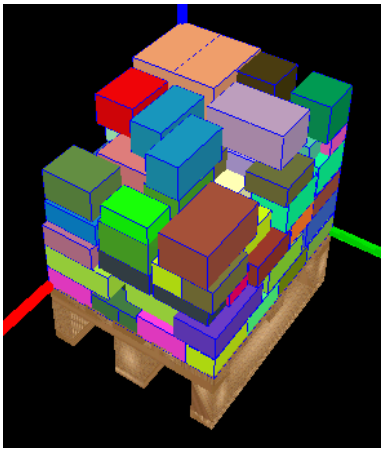
4.3 Food Industry

The food example pallets are using the block set “Food”. The following three orders are defined:

1. Small sized order which should fit onto one pallet
2. Medium sized order which should fit onto 2 – 3 pallets
3. Large sized order which should fit onto 5 – 6 pallets
4. X-Large sized order which should fit into a truck 20 – 24 pallets

4.3.1 Food_001.order.xml

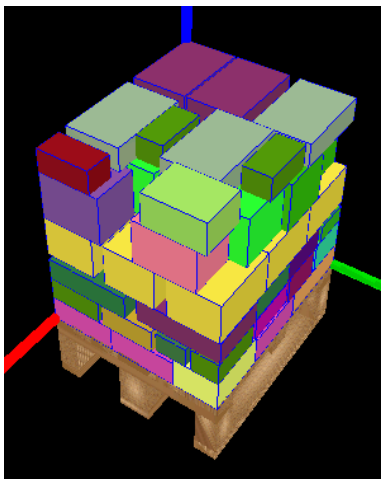
This order consists of 90 order lines with 90 cases in total distributed over 65 different SKUs. Thus some order lines contain the same SKU.



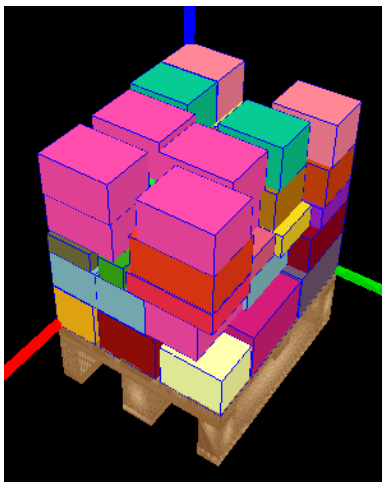
Pallet #1

4.3.2 Food_002.order.xml

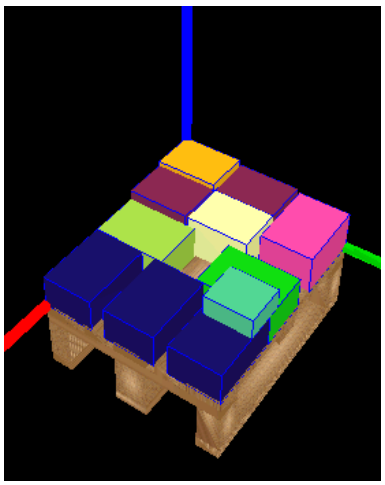
This order consists of 51 order lines with 129 cases in total distributed over 51 different SKUs.



Pallet #1



Pallet #2



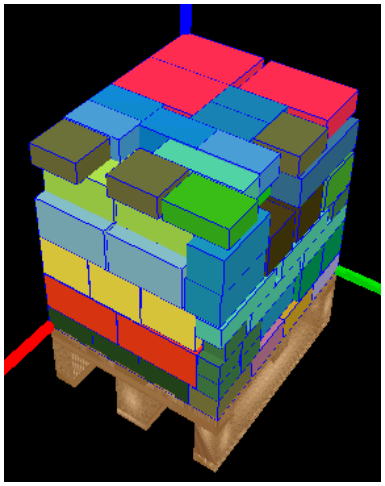
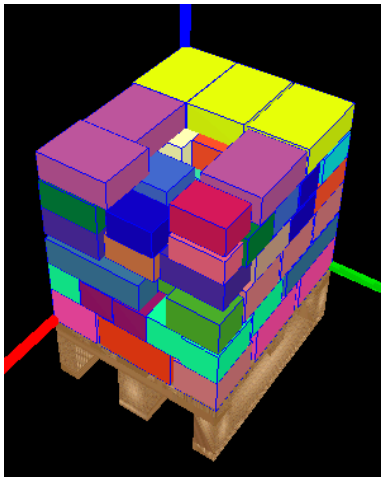
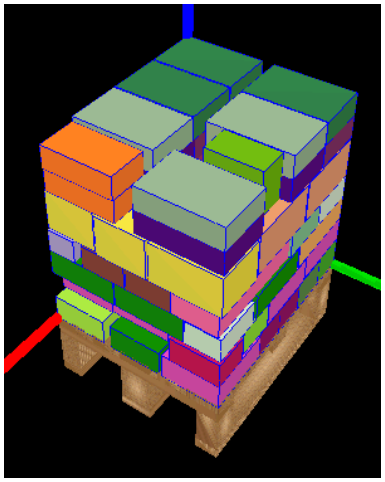
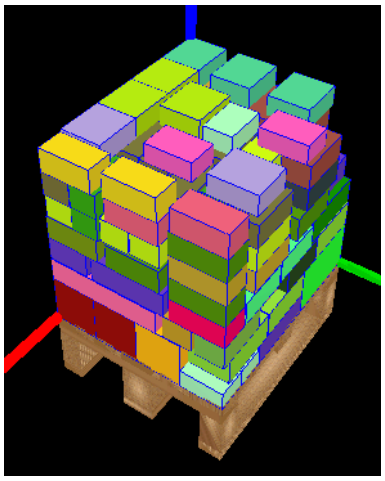
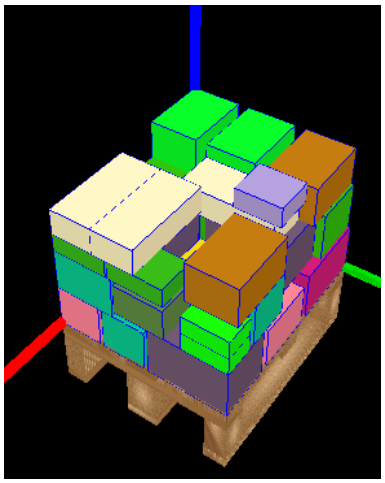
Pallet #3

The used mixed palletizing algorithm was not able to stack all cases onto two pallets, but human pickers are able to build two pallets.

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

4.3.3 Food_003.order.xml

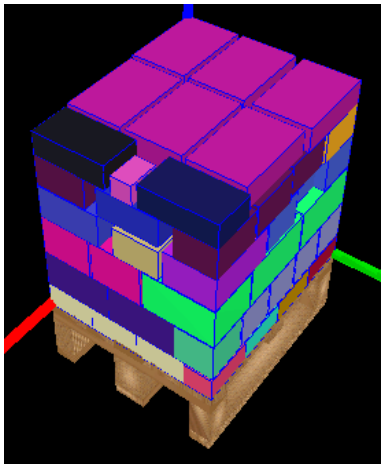
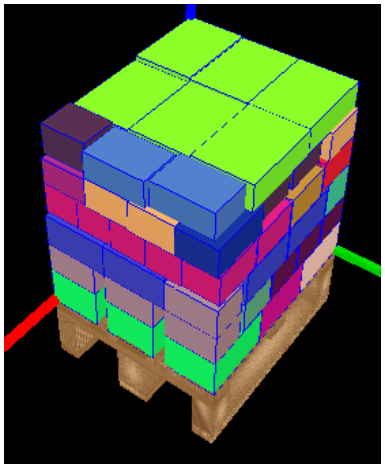
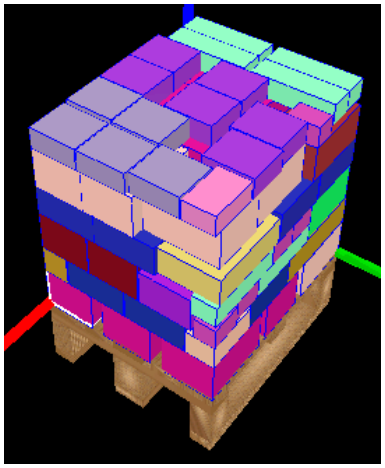
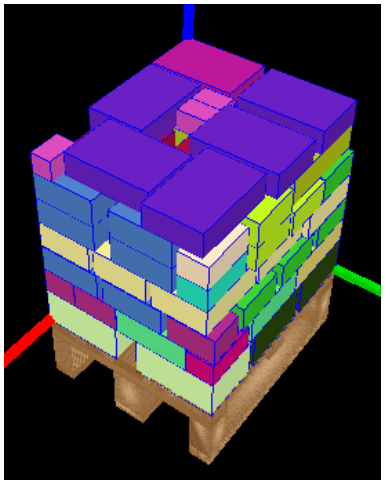
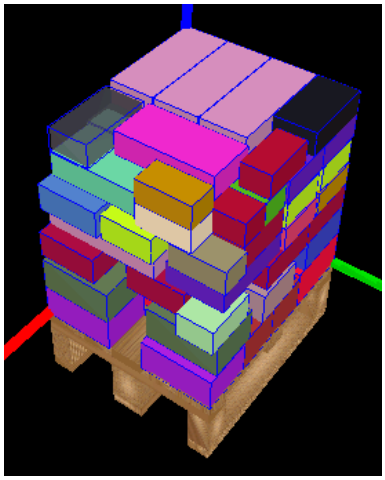
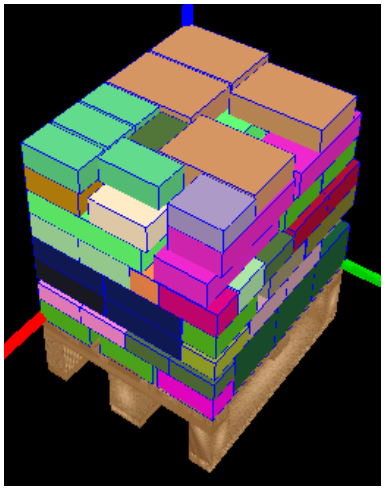
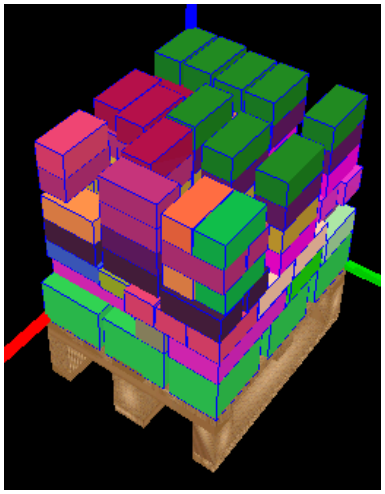
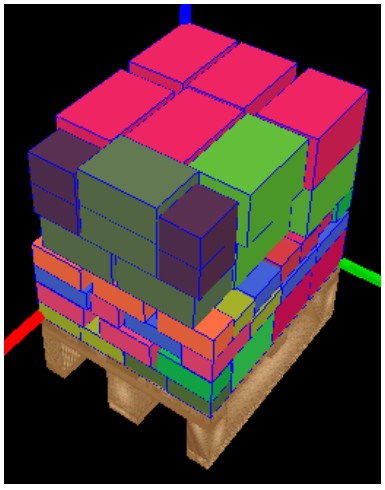
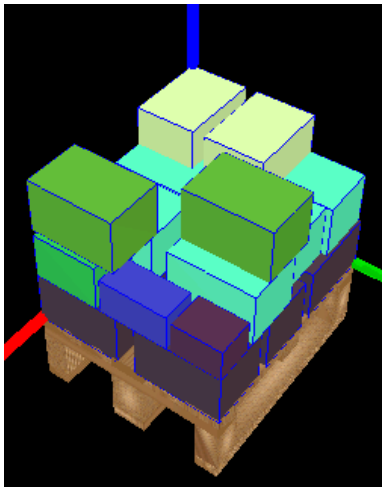
This order consists of 112 order lines with 385 cases in total distributed over 112 different SKUs.

		
Pallet #1	Pallet #2	Pallet #3
		
Pallet #4	Pallet #5	

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

4.3.4 Food_004.order.xml

This order consists of 112 order lines with 688 cases in total distributed over 112 different SKUs.

		
Pallet #1	Pallet #2	Pallet #3
		
Pallet #4	Pallet #5	Pallet #6
		
Pallet #7	Pallet #8	Pallet #9

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com

5 Included Files

This document includes the following additional files:

File	Description
KUKA.PalletMix-XSD.zip	Archive containing all schema files which can be used to validate the input and output XML files (see Chapter 3)
Beverage and Food Orders.01.xls	Excel File containing the block set definitions and the different orders as described in Chapter 4. The Excel Files contains a “quick and dirty” VBA Macro to generate the Order file format from a work sheet.
Food.zip	Archive containing the described order files and its corresponding packlist result files.
Beverage.zip	Archive containing the described order files and its corresponding packlist result files.

Author: Dr. Christian Wurll
Phone: +1 586 883 5132
Fax: +1 866 FAX-KUKA
E-Mail: ChristianWurll@kukarobotics.com