

# Endoscopic Vision Challenge 2017 - Workflow Subchallenge

## Read Me

### 1. Data description

The data provided is a combination of endoscopic video and sensor data from medical devices in an integrated operating room (Karl Storz OR1). The data was obtained during laparoscopic surgeries at the University Hospital of Heidelberg, a center of excellence for minimally invasive surgery. All surgeries were annotated framewise for surgical phases by a surgeon.

The surgeries recorded are colorectal surgeries, namely of type rectal resection, sigmoid resection or proctocolectomy. In contrast to surgeries such as cholecystectomy, these procedures are more complex. This means there are more variations regarding the surgical strategy (length or order of phases) and phases may change repeatedly. Also, every procedure includes an extra-abdominal phase (bowel anastomosis, the connection of two parts of bowel) that is prepared without use of the laparoscope.

#### 1.1 Video data

For each operation, the video of the laparoscopic feed is included in this dataset (ProktoX.avi, RektukX.avi, SigmaX.avi). Frames from extra-abdominal views have been replaced by blue frames (RGB 0 0 255) to ascertain anonymity of the patient and the surgical staff.

#### 1.2 Device data

For each operation, the device streams of the available surgical devices are also provided in csv files (DeviceData.zip: ProktoX\_Device.csv, RektumX\_Device.csv, SigmaX\_Device.csv). The csv files have the following format:

Column	Device	Signal
1	Endoscope	Frame #
2	Thermoflator	Current gas flow rate
3		Target gas flow rate
4		Current gas pressure
5		Target gas pressure
6		Used gas volume
7		Gas supply pressure
8		Device on?
9		OR lights
10	OR lights	Intensity light 1
11		Intensity light 2
12	Endoscopic light source	Intensity
13	Endoscope	White balance
14		Gains
15		Exposure index

If a signal is currently not available, it will be assigned a value of -1.

#### 1.3 Phase annotation

The surgical phases for each operation in the training sets was annotated. The annotations are included in PhaseAnnotation.zip (ProktoX.csv, RektumX.csv, SigmaX.csv). The format used is the following:

<frame #>,<phase id>

e.g.:

- 0, 0
- 1, 0
- ...
- 2453, 5
- 2454, 5
- ...

Also, we provided a subtitle file for each operation (tested on VLC player).

### Phases

The three types of colorectal surgery differ slightly in the phases contained. The following table shows the phases and the id used during annotation. Furthermore it demonstrates which phases can occur in each type of surgery. Italicized phases *may* occur. The next table gives short descriptions/comments of the phases.

ID	Sigmoid resection	Proctocolectomy	Rectal resection
0	Preparation and orientation at abdomen	Preparation and orientation at abdomen	Preparation and orientation at abdomen
1	Dissection of lymphnodes and blood vessels	Dissection of lymphnodes and blood vessels	Dissection of lymphnodes and blood vessels
2	<i>Retroperitoneal preparation to lower pancreatic border</i>		Retroperitoneal preparation to lower pancreatic border
3		Retroperitoneal preparation of duodenum and pancreatic head	
4	Mobilizing the sigmoid and the descending colon	Mobilizing the sigmoid and the descending colon	Mobilizing the sigmoid and the descending colon
5	<i>Mobilizing the splenic flexure</i>	Mobilizing the splenic flexure	<i>Mobilizing the splenic flexure</i>
6	<i>Mobilizing the tranverse colon</i>	Mobilizing the tranverse colon	<i>Mobilizing the tranverse colon</i>
7		Mobilizing the ascending colon	
8	Dissection and resection of rectum	Dissection and resection of rectum	Dissection and resection of rectum
9	Preparing the anastomosis extraabdominally	Preparing the anastomosis extraabdominally	Preparing the anastomosis extraabdominally
10	Preparing the anastomosis intraabdominally	Preparing the anastomosis intraabdominally	Preparing the anastomosis intraabdominally
11		Placing stoma	Placing stoma
12	Finishing the operation	Finishing the operation	Finishing the operation
13	NOOP	NOOP	NOOP

Phase	Comment/Description
Preparation and orientation at abdomen	Starts when camera is first inserted into abdomen. May include attaching uterus to abdominal wall. (Usually) ends, when the first instrument is inserted to manipulate colon.
Dissection of lymphnodes and blood vessels	Includes dissection of mesorectum after division of vessels
Retroperitoneal preparation to lower pancreatic border	Includes retroperitoneal preparation towards lower border of pancreas.
Retroperitoneal preparation of duodenum and pancreatic head	Preparation of duodenum which is behind ascending colon. Phase is similar to Pancreas for descending colon.
Mobilizing the sigmoid and the descending colon	Comprises both, sigmoid and descending colon below splenic flexure. Includes positioning and control of descending colon after mobilization
Mobilizing the splenic flexure	Includes retroperitoneal preparation towards lower border of pancreas
Mobilizing the tranverse colon	Includes separation from greater omentum
Mobilizing the ascending colon	
Dissection and resection of rectum	For sigmoid can include only circular preparation of rectosigmoid for resection. Can include preparation of right ureter.
Preparing the anastomosis extraabdominally	Includes supraumbilical incision and extraction of specimen. For procto includes preparation of a ileal pouch
Preparing the anastomosis intraabdominally	Starts when extraabdominal preparation of anastomosis is finished. Includes irrigation and stopping of bleeding of small pelvis and other places in the abdomen after resection and after extrabdominal preparation of anastomosis. May also include additional mobilisation of ileum, colon or (in sigma surgery) remaining rectum to avoid tension on the anastomosis.
Placing stoma	Can include extraabdominal part for positioning of stoma and afterwards laparoscopic control for torquation of bowel. Suturing of stoma may take place before final laparoscopic control or afterwards.
Finishing the operation	Includes insertion of drain as well as irrigation and final check for bleeding. May include final suturing of bowel lesions.



2454,5

...