Documentation BirdScan MR1 Data Structure

Project:	BirdScan MR1 Data Structure
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1 Database structure

The structure of the database (BirdScan v1.6) is shown in Figure 1. The figure shows the tables used by the MR1 Analysis tool. The database contains more tables than shown in Figure 1 which are not relevant for analysis purposes.

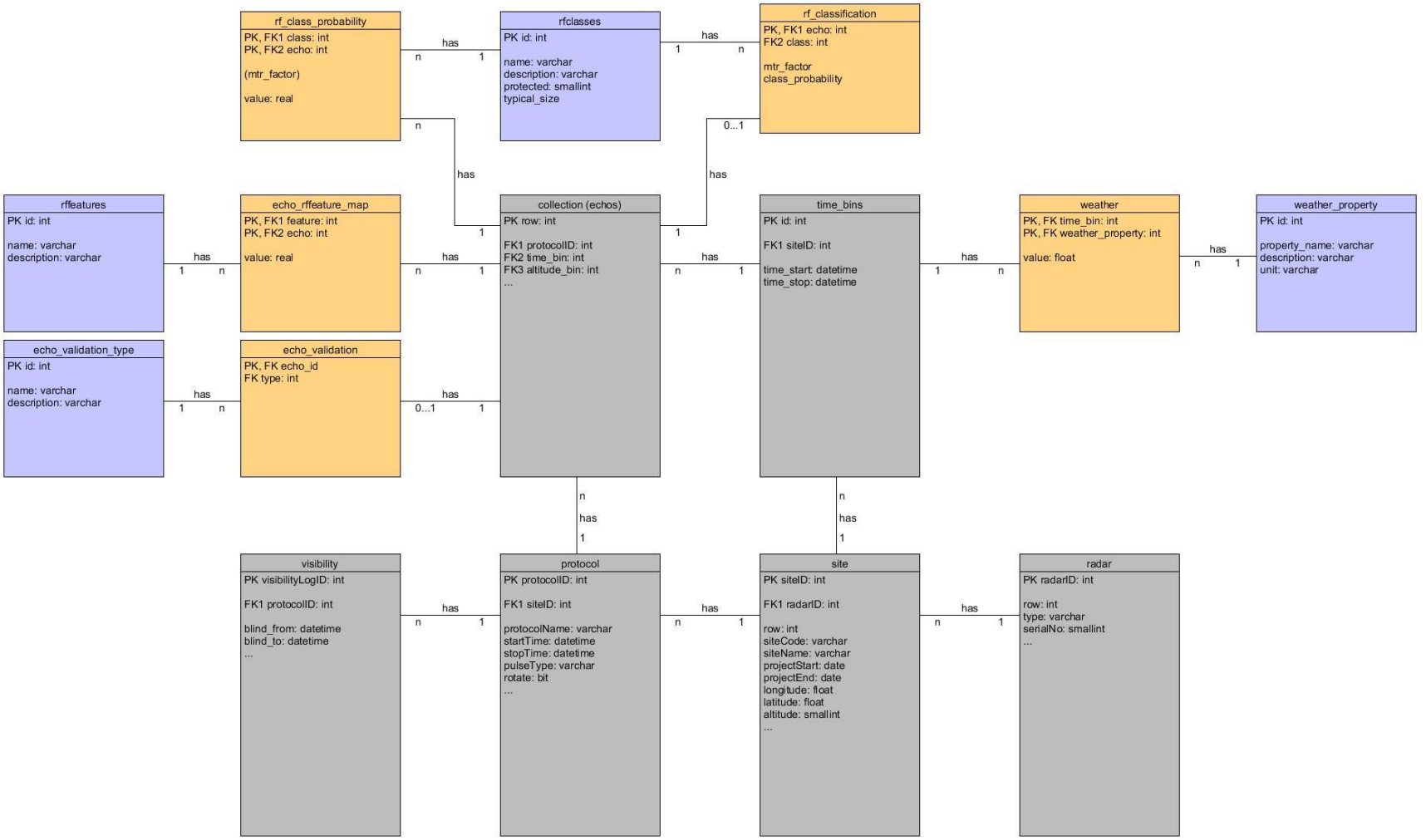

Figure 1: part of the database structure BirdScan v1.6

2 Database Tables

2.1 Collection

The collection table stores information about the detected echoes, one row per echo.

key type	name	datatype	linked to table
primary key	row	int	-
foreign key	protocolID	int	protocol
foreign key	time_bin	int	time_bins

Table 1: collection table keys

column	datatype	description	outdated by birdscan v1.6
echoID	int	Echo ID	no
protocolID	int	link to protocol table	no
stc_level	float	stc_level in dBm, used to calculate mtr-factors	no
mtr_fact	float	mtr-factor based on the old classification	yes
time_bin	int	link to time_bins table	no
statistical_classification	smallint	naive bayes classification	yes
time_stamp	datetime	timestamp of the echo	no
feature1	float	altitude in meters a.g.l.	no
feature2	float	azimuth in degree	no
feature3	float	speed in m/s	no
feature6	float	radar rotation frequency in Hz	no
feature14	float	maxlevel received in dBm	no
feature15	float	polarisation ratio	yes
feature16	float	absolute polarisation	yes
feature17	float	radar cross section (RCS) in m^2	no
feature18	float	square root of RCS	no
feature19	float	duration of echo in s	no
feature20	float	duration of echo in STC	no
feature24	float	alpha: angle between entry- and exit angle in the detection range in degrees	no

Table 2: important columns in collection table

2.2 time_bins

Every 5 minutes a new time bin is created and stored in the time_bins table. The time_bins table does not contain any information but start and stop time of the time bin. Other tables are linked to the time_bins table and store information per time bin or allow filtering by time bin.

key type	name	datatype	linked to table
primary key	id	int	-
foreign key	siteID	int	site

Table 3: time_bins table keys

column	datatype	description	outdated by birdscan v1.6
time_start	datetime	start time and date of the time bin	no
time_stop	datetime	stop time and date of the time bin	no

Table 4: important columns in time_bins table

2.3 protocol

The protocol table contains information about the operation mode of the radar. On each change of the operation mode (pulse-type, rotation, …) a new protocol is added in the protocol table.

key type	name	datatype	linked to table
primary key	protocolID	int	-
foreign key	siteID	int	site

Table 5: protocol table keys

column	datatype	description	outdated by birdscan v1.6
protocolID	int	protocol ID	no
siteID	int	site ID	no
startTime	datetime	start time and date of the protocol	no
stop_time	datetime	stop time and date of the protocol	no
pulseType	varchar	pulsetype: short, medium, long (“S”,”M”,”L”)	no
rotate	bit	radar in rotation mode (1/0)	no
stc	float	STC altitude in m	no
threshold	float	stc threshold in dBm	no
blockTime	float	time radar is blind after protocol change in secs	no

Table 6: important columns in protocol table

2.4 visibility

The visibility table store the times when the radar was blind due to weather conditions (rain, snow, heavy fog), clutter (e.g.: radome covered with snow or leaves, too many objects like trees, houses or

vehicles nearby) or protocol changes. Blindtimes in the visibility table are linked to one protocol and are thus split if expanding over two or more protocols.

key type	name	datatype	linked to table
primary key	visibilityLogID	int	-
foreign key	protocolID	int	protocol

Table 7: visibility table keys

column	datatype	description	outdated by birdscan v1.6
visibilityLogID	int	visibility ID	no
protocolID	int	link to protocol table	no
blind_from	datetime	start time from when the radar was blind	no
blind_to	datetime	stop time to when the radar was blind	no

Table 8: important columns in visibility table

2.5 site

The site table contains information about the site where the radar is placed. One row per site.

key type	name	datatype	linked to table
primary key	siteID	int	-
foreign key	radarID	int	radar

Table 9: site table keys

column	datatype	description	outdated by birdscan v1.6
siteID	int	site ID	no
siteCode	varchar	3-letters abbreviation of the sitename	no
radarID	smallint	radar ID	no
siteName	varchar	name of the site	no
siteDesc	varchar	description of the site	no
projectStart	date	startdate of the project/campaign	no
projectEnd	date	enddate of the project/campaign	no
longitude	float	longitude of the site location in decimal degrees	no
latitude	float	latitude of the site location in decimal degrees	no
altitude	smallint	altitude a.s.l. of the site location in m	no
timeShift	varchar	time shift/zone at the site location	no
radarOrientation	float	orientation of the radar to north on site	no

Table 10: important columns in site table

2.6 radar

The radar table contains information about the radar hardware. For general analysis these values are not of interest.

key type	name	datatype	linked to table
primary key	radarID	int	-

Table 11: radar table keys

column	datatype	description	outdated by birdscan v1.6
radarID	smallint	radar ID	no
type	varchar	radar Type	no
serialNo	smallint	serial number	no

Table 12: important columns in radar table

2.7 weather and weather_property

The weather table contains information about the environment. The temperature/humidity sensors are placed inside the radar (one inside the radome and one behind the ventilation inlet) and do not represent the outside air temperature and humidity. The weather table is linked to the time_bins table and the weather_property table. One row per time bin and weather property is created.

The weather_property table describes all weather properties.

key type	name	datatype	linked to table
primary/foreign key	time_bin	int	time_bins
primary/foreign key	weather_property	int	weather_property

Table 13: weather table keys

key type	name	datatype	linked to table
primary key	id	int	-

Table 14: weather_property table keys

property	id	unit
Temperature Radome	1	degree C
Temperature Fresh Air	2	degree C
Relative Humidity Radome	3	%
Relative Humidity Fresh Air	4	%
Blind Time Percent	5	%

Table 15: weather properties

2.8 echo_rffeatures_map and rffeatures

The rffeatures table lists all features that are computed by the algorithms. A selection of them is used by the random forest models for classification and wing beat frequency estimation. The wing beat

frequency and its credibility are part of the rffeatures and thus saved in the echo_rffeatures_map table. The echo_rffeatures_map contains one row per echo and rffeature.

The features are roughly described in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**.

key type	name	datatype	linked to table
primary/foreign key	echo	int	collection
primary/foreign key	feature	int	rffeatures

Table 16: echo_rffeatures_map table keys

key type	Name	datatype	linked to table
primary key	Id	int	-

Table 17: rffeatures table keys

2.9 echo_validation and echo_validation_type

The echo validation algorithm of the BirdScan software validates each echo, if it is a valid bio scatterer or non-bio scatterer like rain, snow or ground clutter. The two types are listed in the echo_validation_type table and in the echo_validation table one row per echo is listed with its validation.

The echo validation algorithm is only working with raw radar data; therefore, the echo validation is not available for reclassified databases created by BirdScan versions older than v1.6.

key type	name	datatype	linked to table
primary/foreign key	echo_id	int	collection
foreign key	type	int	echo_validation_type

Table 18: echo_validation table keys

key type	name	datatype	linked to table
primary key	id	int	-

Table 19: echo_validation_type table keys

property	id
bio scatterer	1
non-bio scatterer	2

Table 20: echo validation types

2.10 rf_classification and rfclasses

the rf_classification table contains the classification based on the random forest classifier released with BirdScan version v1.6. The available classes are listed in the rfclasses table. The rfclasses table lists more classes than used by the classifier. Refer to the column ‘isUsedForClassification’ to get the classes used by the classifier.

key type	name	datatype	linked to table
primary/foreign key	echo	int	collection
foreign key	class	int	rfclasses

Table 21: rf_classification table keys

key type	name	datatype	linked to table
primary key	id	int	-

Table 22: rfclasses table keys

column	datatype	description	outdated by birdscan v1.6
echo	int	echo ID, link to collection table	no
class	int	class ID, link to rfclasses table	no
mtr_factor	real	MTR factor based on the random forest classifier	no
class_probability	real	classification probability	no

Table 23: important columns in rf_classification table

2.11 rf_class_probability

The rf_class_probability table is like the rf_classification table linked to the collection and rfclasses table. It lists the probabilities as well as the MTR factors for all classes. The MTR factor is dependent on the size of the object (RCS). For small RCS, the RCS is replaced by a typical size for the class. Therefore, the MTR factor for one echo maybe different according to the classification.

This table exists for the case if one wants to change classifications manually, the probabilities and MTR factors do not have to be recalculated.

The table contains one row per echo and class.

key type	name	datatype	linked to table
primary/foreign key	echo	int	collection
primary/foreign key	class	int	rfclasses

Table 24: rf_class_probability table keys