

GUNGNIR DARTSTRACKER API

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General Information

The dartstracker offers several interfaces to basically the same API, when a valid license is installed. These are :

-Websocket

-Web API (http)

-Bluetooth

They all basically call the same functions, but through different interfaces. Below a description of those interfaces and the differences between them.

Websocket

A detection interface is available on a websocket at port 8080. This interface contains the messages needed for detection of throws and removals as well as giving correction feedback to the dartstracker. Calibration, downloading diagnostics and network messages are not part of this interface. Check the web-API's or bluetooth interface for them.

1. Connect to the websocket on `ws://<ipaddress>:8080`.
2. Send a `START_DETECTION` command.
3. Show a message to the user in the Game UI like 'Remove darts from board or put hand on board.' and wait for the `REMOVAL_START` followed by the `REMOVAL_END` message. After the `REMOVAL_END` message the match can be started.
4. When a match is being played the following messages (events) are sent by the dartstracker:
 - `DETECTED_THROW` : When a dart is detected a `DETECTED_THROW` message is sent.
 - `REMOVAL_START`: When a dart is removed first a `REMOVAL_START` message is sent.
 - `REMOVAL_END`: When removing and the board is empty a `REMOVAL_END` is sent.

The following message can be sent to the dartstracker during a match.

- `CORRECTION` (Optional): When a dart is corrected in the game, you can send a `CORRECTION` message to the dartstracker. This message is used to adjust the rotation of the board when adjustments are made from for example sector 1 to sector 20. Or to change the sector size when sectors change from for example a triple to a single.

Messages

Below the definition of the commands that can be sent and the messages that can be received to and by the dartstracker.

START_DETECTION

Sent from the client to the dartstracker when starting a match.

Json example:

```
{"CommandType":1}
```

CORRECTION

Sent from the client to the dartstracker to let the dartstracker adjust calibration values.

Json example:

```
{"CommandType":2,"Payload":{"FromSector":16,"ToSector":7,"FromMultiplier":1,"ToMultiplier":1,"Index":1}}
```

FromSector : The sector where the dart was (wrongly)detected.

ToSector: The sector the dart is corrected to by the user.

FromMultiplier: The multiplier where the dart was wrongly detected.

ToMultiplier: The multiplier the dart is corrected to by the user.

Index: Was it the first, second or third dart of the turn. It's zero based so throw 1 is index 0. Throw 2 is index 2 and throw 3 is index 2.

DETECTED_THROW

When a dart is detected this message is sent from the dartstracker to the client. This message contains lots of data, the detected throw being ofcourse the most important in the fields Sector and Multiplier. The message also contains the most plausible alternatives to choose from when a dart is detected wrong. The list is ordered from from most plausible to least plausible alternative.

The most important elements are in bold below.

Json example:

```
{"eventTime":"2024-03-30T21:48:49.983806Z","AlternativeThrows":[{"MessageType":6,"Type":1,"TotalPoints":11,"Sector":11,"Multiplier":1},{MessageType":6,"Type":3,"TotalPoints":42,"Sector":14,"Multiplier":3},{MessageType":6,"Type":1,"TotalPoints":14,"Sector":14,"Multiplier":1}],{"MessageType":1,"Rays":[{"CamNumber":2,"CamPoint":{"IsEmpty":false,"X":2233.0,"Y":729.0},"RayPoint":{"IsEmpty":false,"X":2390.46558,"Y":2632.56641,"Confidence":1292.5,"Color":{"V0":0.0,"V1":255.0,"V2":255.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":806.7996,"Y":387.0},"Angle":2.7510251998901367,"UncalibratedAngle":2.7510251998901367,"SpikePoint1":{"IsEmpty":false,"X":744.7177,"Y":1054.80139},"SpikePoint2":{"IsEmpty":false,"X":880.429138,"Y":940.588867},"DartContour":{"CamCenter":671.7308349609375,"CamNumber":1,"CamPoint":{"IsEmpty":false,"X":326.0,"Y":729.0},"RayPoint":{"IsEmpty":false,"X":4274.98633,"Y":3795.8396,"Confidence":2079.0,"Color":{"V0":0.0,"V1":0.0,"V2":255.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":836.7611,"Y":402.0},"Angle":0.66031789779663086,"UncalibratedAngle":0.66031789779663086,"SpikePoint1":{"IsEmpty":false,"X":799.1107,"Y":937.286865},"SpikePoint2":{"IsEmpty":false,"X":868.8373,"Y":1061.49731},"DartContour":{"CamCenter":698.71832275390625,"CamNumber":3,"CamPoint":{"IsEmpty":false,"X":1656.0,"Y":245.0},"RayPoint":{"IsEmpty":false,"X":1125.36316,"Y":4399.999},"Confidence":1676.0,"Color":{"V0":34.0,"V1":139.0,"V2":34.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":892.488159,"Y":360.0},"Angle":2.1606900691986084,"UncalibratedAngle":2.1606900691986084,"SpikePoint1":{"IsEmpty":false,"X":842.072449,"Y":1057.648},"SpikePoint2":{"IsEmpty":false,"X":952.026062,"Y":939.3274},"DartContour":{"CamCenter":645.11981201171875,"CamNumber":4,"CamPoint":{"IsEmpty":false,"X":903.0,"Y":245.0},"RayPoint":{"IsEmpty":false,"X":1329.811,"Y":5226.75},"Confidence":1984.5,"Color":{"V0":255.0,"V1":0.0,"V2":0.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":953.3355,"Y":416.0},"Angle":1.4853301048278809,"UncalibratedAngle":1.4853301048278809,"SpikePoint1":{"IsEmpty":false,"X":914.6758,"Y":1061.50439},"SpikePoint2":{"IsEmpty":false,"X":998.6897,"Y":936.730164},"DartContour":{"CamCenter":681.9473876953125}],{"Poi":{"IsEmpty":false,"X":988.4392,"Y":1242.24988},"Type":3,"TotalPoints":33,"Sector":11,"Multiplier":3,"DistanceToBullInMm":97.9981689453125,"ProjectionResolution":2560}
```

AlternativeThrows: List of most plausible alternatives.

Poi: Point on the board.

ProjectionResolution: Resolution of the board

DistanceToBullInMm: Distance to bull.

Sector: Sector of the throw

Multiplier: Multiplier of the throw.

REMOVAL_START

:402.0}, "Angle":0.66031789779663086, "UncalibratedAngle":0.66031789779663086, "SpikePoint1":{"IsEmpty":false, "X":799.1107, "Y":-937.286865}, "SpikePoint2":{"IsEmpty":false, "X":868.8373, "Y":1061.49731}, "DartContour":{"CamCenter":{"CamNumber":3, "CamPoint":{"IsEmpty":false, "X":1656.0, "Y":245.0}, "RayPoint":{"IsEmpty":false, "X":-1125.36316, "Y":4399.999}, "Confidence":1676.0, "Color":{"V0":34.0, "V1":139.0, "V2":34.0, "V3":0.0}, "SurfacePoint":{"IsEmpty":false, "X":892.488159, "Y":360.0}, "Angle":2.1606900691986084, "UncalibratedAngle":2.1606900691986084, "SpikePoint1":{"IsEmpty":false, "X":842.072449, "Y":1057.648}, "SpikePoint2":{"IsEmpty":false, "X":952.026062, "Y":-939.3274}, "DartContour":{"CamCenter":645.11981201171875}, {"CamNumber":4, "CamPoint":{"IsEmpty":false, "X":903.0, "Y":245.0}, "RayPoint":{"IsEmpty":false, "X":1329.811, "Y":5226.75}, "Confidence":1984.5, "Color":{"V0":255.0, "V1":0.0, "V2":0.0, "V3":0.0}, "SurfacePoint":{"IsEmpty":false, "X":953.3355, "Y":416.0}, "Angle":1.4853301048278809, "UncalibratedAngle":1.4853301048278809, "SpikePoint1":{"IsEmpty":false, "X":914.6758, "Y":1061.50439}, "SpikePoint2":{"IsEmpty":false, "X":998.6897, "Y":-936.730164}, "DartContour":{"CamCenter":681.9473876953125}, {"Poi":{"IsEmpty":false, "X":988.4392, "Y":1242.24988}, "Type":3, "TotalPoints":33, "Sector":11, "Multiplier":3, "DistanceToBullInMm":97.9981689453125, "ProjectionResolution":2560}

<= {"eventTime":"2024-03-30T21:49:24.937887Z", "AlternativeThrows":[], "MessageType":1, "Rays":[{"CamNumber":1, "CamPoint":{"IsEmpty":false, "X":326.0, "Y":729.0}, "RayPoint":{"IsEmpty":false, "X":5160.0376, "Y":2006.52856}, "Confidence":2443.5, "Color":{"V0":0.0, "V1":0.0, "V2":255.0, "V3":0.0}, "SurfacePoint":{"IsEmpty":false, "X":425.665527, "Y":402.0}, "Angle":0.25837075710296631, "UncalibratedAngle":0.25837075710296631, "SpikePoint1":{"IsEmpty":false, "X":378.3563, "Y":1057.8551}, "SpikePoint2":{"IsEmpty":false, "X":481.530365, "Y":-939.482}, "DartContour":{"CamCenter":698.71832275390625}, {"CamNumber":3, "CamPoint":{"IsEmpty":false, "X":1656.0, "Y":245.0}, "RayPoint":{"IsEmpty":false, "X":-1316.63477, "Y":4265.37842}, "Confidence":2239.5, "Color":{"V0":34.0, "V1":139.0, "V2":34.0, "V3":0.0}, "SurfacePoint":{"IsEmpty":false, "X":942.9547, "Y":360.0}, "Angle":2.2074735164642334, "UncalibratedAngle":2.2074735164642334, "SpikePoint1":{"IsEmpty":false, "X":774.4162, "Y":1041.34277}, "SpikePoint2":{"IsEmpty":false, "X":1142.80688, "Y":-924.4365}, "DartContour":{"CamCenter":645.11981201171875}, {"CamNumber":2, "CamPoint":{"IsEmpty":false, "X":2233.0, "Y":729.0}, "RayPoint":{"IsEmpty":false, "X":-2675.47559, "Y":1681.29565}, "Confidence":1085.5, "Color":{"V0":0.0, "V1":255.0, "V2":255.0, "V3":0.0}, "SurfacePoint":{"IsEmpty":false, "X":1018.737, "Y":387.0}, "Angle":2.949962854385376, "UncalibratedAngle":2.949962854385376, "SpikePoint1":{"IsEmpty":false, "X":984.785156, "Y":1080.06616}, "SpikePoint2":{"IsEmpty":false, "X":1057.12476, "Y":-918.6251}, "DartContour":{"CamCenter":671.7308349609375}, {"CamNumber":4, "CamPoint":{"IsEmpty":false, "X":903.0, "Y":245.0}, "RayPoint":{"IsEmpty":false, "X":2508.262, "Y":4980.307}, "Confidence":2349.5, "Color":{"V0":255.0, "V1":0.0, "V2":0.0, "V3":0.0}, "SurfacePoint":{"IsEmpty":false, "X":704.527954, "Y":416.0}, "Angle":1.2439558506011963, "UncalibratedAngle":1.2439558506011963, "SpikePoint1":{"IsEmpty":false, "X":484.118042, "Y":1031.23059}, "SpikePoint2":{"IsEmpty":false, "X":965.2892, "Y":-910.0253}, "DartContour":{"CamCenter":681.9473876953125}, {"Poi":{"IsEmpty":false, "X":1139.71008, "Y":943.262939}, "Type":1, "TotalPoints":5, "Sector":5, "Multiplier":1, "DistanceToBullInMm":121.5972900390625, "ProjectionResolution":2560}


```

<= {"eventTime":"2024-03-30T21:49:27.342929Z","AlternativeThrows":{"MessageType":6,"Type":2,"TotalPoints":32,"Sector":16,"Multiplier":2},{MessageType":6,"Type":4,"TotalPoints":0,"Sector":8,"Multiplier":0},{MessageType":6,"Type":2,"TotalPoints":16,"Sector":8,"Multiplier":2}},{"MessageType":1,"Rays":[{"CamNumber":2,"CamPoint":{"IsEmpty":false,"X":2233.0,"Y":729.0},"RayPoint":{"IsEmpty":false,"X":2103.55,"Y":3217.842},"Confidence":893.5,"Color":{"V0":0.0,"V1":255.0,"V2":255.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":674.938232,"Y":387.0},"Angle":2.6205687522888184,"UncalibratedAngle":2.6205687522888184,"SpikePoint1":{"IsEmpty":false,"X":661.776245,"Y":940.2433},"SpikePoint2":{"IsEmpty":false,"X":686.098,"Y":1059.60876},"DartContour":{"CamCenter":671.7308349609375},"CamNumber":4,"CamPoint":{"IsEmpty":false,"X":903.0,"Y":245.0},"RayPoint":{"IsEmpty":false,"X":604.0722,"Y":5236.056},"Confidence":1535.5,"Color":{"V0":255.0,"V1":0.0,"V2":0.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":1117.5448,"Y":416.0},"Angle":1.630617618560791,"UncalibratedAngle":1.630617618560791,"SpikePoint1":{"IsEmpty":false,"X":989.7182,"Y":938.2589},"SpikePoint2":{"IsEmpty":false,"X":1224.73779,"Y":1047.88452},"DartContour":{"CamCenter":681.9473876953125},"CamNumber":1,"CamPoint":{"IsEmpty":false,"X":326.0,"Y":729.0},"RayPoint":{"IsEmpty":false,"X":2917.27856,"Y":5005.12842},"Confidence":2033.0,"Color":{"V0":0.0,"V1":0.0,"V2":255.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":1250.43774,"Y":402.0},"Angle":1.0259861946105957,"UncalibratedAngle":1.0259861946105957,"SpikePoint1":{"IsEmpty":false,"X":1038.139,"Y":923.742249},"SpikePoint2":{"IsEmpty":false,"X":1428.86755,"Y":1037.71936},"DartContour":{"CamCenter":698.71832275390625},"CamNumber":3,"CamPoint":{"IsEmpty":false,"X":1656.0,"Y":245.0},"RayPoint":{"IsEmpty":false,"X":1041.37781,"Y":4455.00635},"Confidence":1081.0,"Color":{"V0":34.0,"V1":139.0,"V2":34.0,"V3":0.0},"SurfacePoint":{"IsEmpty":false,"X":871.1957,"Y":360.0},"Angle":2.1406104564666748,"UncalibratedAngle":2.1406104564666748,"SpikePoint1":{"IsEmpty":false,"X":777.915039,"Y":938.051758},"SpikePoint2":{"IsEmpty":false,"X":950.007935,"Y":1054.5304},"DartContour":{"CamCenter":645.11981201171875},"Poi":{"IsEmpty":false,"X":825.635559,"Y":1536.71765},"Type":4,"TotalPoints":0,"Sector":16,"Multiplier":0,"DistanceToBullInMm":173.95751953125,"ProjectionResolution":2560}
<= {"eventTime":"2024-03-30T21:49:30.04128Z","MessageType":4}
<= {"eventTime":"2024-03-30T21:49:32.142364Z","MessageType":5}

```

Web Api's

The web api's are available through http get calls on the web services described below.

Detection Service

The detection service contains the same calls as the websocket. The difference is that to get the latest event a polling mechanism (fetchlast) needs to be used instead of the event that's fired in the websocket.

Startdetection

Sets the dartstracker in detection mode

<http://<ip-address>/General/DetectionService.aspx?command=startdetection>

FetchLast

Gets the last event from the dartstracker. Poll this with very short intervals of about 100 ms, to not miss any events.

<http://<ip-address>/General/DetectionService.aspx?command=fetchlast>

This returns the same json messages as described in the websocket.

Correction

Give feedback to the dartstracker by correcting a throw. This finetunes the dartstracker.

<http://<ip-address>/General/DetectionService.aspx?command=correction&index=2&fromSector=1&toSector=2&fromMultiplier=3&toMultiplier=1>

Index is the dartnumber of a turn. 0=dart 1, 1 = dart 2, 2 = dart 3

Calibration Service

The calibration api contains the messages needed to select a calibration routine and run it. As well a polling message to get the current status.

Currentroutine

Sets the current index of the calibration routine to execute. The following indices can be used:

0 : Complete Calibration (All calibrations executed one after another)

1: Board Calibration. Place a dart around the board on every circle. Double, triple, single and bull calibration.

2: Camera Height Calibration. Check height of camera's using the sphere placed in center of board.

3: Detection Area Calibration. Camera ROI, Camera Rotation and board center calibration.

4: Sector calibration. Specific sector calibration.

<http://<ip-address>/General/CalibrationService.aspx?command=currentroutine&index=<index>>

Start

Starts the current calibration routine.

<http://<ip-address>/General/CalibrationService.aspx?command=start>

Getstate

Returns information about the current state of the calibration routine. When calibrating this method needs to be polled to know when the calibration has ended. It contains the texts to show to the user and buttons to show.

<http://<ip-address>/General/CalibrationService.aspx?command=getstate>

```
{"Result":"","Status":0,"ShowCalibratebutton":false}
```

```
{"Result":"Leave board empty, remove number ring and surround then press Calibrate","Status":1,"ShowCalibratebutton":true}
```

Calibrate

Execute current calibration step.

<http://<ip-address>/General/CalibrationService.aspx?command=calibrate>

Restart

Restart the current calibration routine.

<http://<ip-address>/General/CalibrationService.aspx?command=restart>

Currentsector

Sets the current sector to calibrate when using the Sector Calibration (4).

<http://<ip-address>/General/CalibrationService.aspx?command=currentsector§or=14>

Resetsector

Resets the calibrations for the current sector to default when using the Sector Calibration (4)

Resetallsectors

Resets all sector specific calibrations to default when using the Sector Calibration (4)

Diagnostics Service

Commands

Generate

Generates the diagnostics pdf and returns it as response.

<http://<ip-address>/General/DiagnosticsService.aspx?command=generate>

Detection Log

Open webservice call (No License required) that only returns the number and multiplier of the last detected throw. No removal events or anything else can be retrieved via this call.

<http://192.168.2.73/General/DetectionLog.aspx>

```
{"Sector":6,"Multiplier":3}
```

Bluetooth interface

The API's that are available via web interfaces are also available via bluetooth. In addition the bluetooth interface also has a network interface to get the dartstracker onto a wifi network. To use the bluetooth interface you will have to disable the 'encrypted bluetooth' setting in the System..License menu.

Disabling encryption will mean that the standard dartstrainer app won't be able to connect with the dartstracker, but you can let your own app connect to the dartstracker and use the bluetooth interface.

Below an overview of the messages that can be send and retrieved. For a functional description check the web-api's that have the same commands. Only the networking API will contain more information in this chapter.

The dartstracker implements BLE with 1 service and several characteristics.

service	uid
Gungnir	00000001-0000-0000-0000-ebebebebebeb

It has several characteristics:

characteristic	uid
Calibration	00000001-0015-0000-0000-ebebebebebeb
Diagnostics	00000001-0012-0000-0000-EBEBEBEBEBEB
Detection	00000001-0001-0000-0000-ebebebebebeb

Network	00000001-0002-0000-0000-ebebebebebeb
---------	--------------------------------------

Below a description of the available characteristics and their functions.

CalibrationCharacteristics

Write

Currentroutine

name	type	value
command	int32	0
index	int32	0-4

Index values:

0 : Complete Calibration (All calibrations executed one after another)

1: Board Calibration. Place a dart around the board on every circle. Double, triple, single and bull calibration.

2: Camera Height Calibration. Check height of camera's using the sphere placed in center of board.

3: Detection Area Calibration. Camera ROI, Camera Rotation and board center calibration.

4: Sector calibration. Specific sector calibration.

Start

name	type	value
command	int32	1

Calibrate

name	type	value
command	int32	2

Restart

name	type	value
command	int32	3

Resetsector

name	type	value
command	int32	4

ResetAllSector

name	type	value
command	int32	5

SetCurrentSector

name	type	value
sector	int32	>5

Write a value larger then 5 to set the current sector. For sector 1 this means 6, sector 2 is 7, sector 3 is 8 sector 20 is 25 etc.

Read

GetCurrentState

name	type	value
status	int32	Idle = 0 Started = 1 Finished = 2 Starting = 3
Show calibrate button	byte8	Boolean true/false
result	byte[x] (length is undefined, read to the end of the message)	ASCII string

DiagnosticsCharacteristic

Write an arbitrary value. Then read(poll) until a bytearray with length > 0 is received. This is an int32 containing the number of chunks to receive. Then keep reading and concatenating the returned byte arrays until the nr of chunks is received. The resulting byte array is a pdf containing the diagnostics.

LogCharacteristic

Write

Start Detection

name	type	value
command	int32	0

Correction

name	type	value
command	int32	1
From sector	int32	1-25
From multiplier	int32	0-3
To sector	int32	1-25
To multiplier	int32	0-3
Throw index	int32	0-2 (0=dart 1, 1= dart 2, 2 = dart 3)

Read

Returns an empty byte array if nothing happened or else

name	type	value
messagetype	int32	1
sector	int32	0-25
multiplier	int32	0-3

xpos	double64	0.0-1.0
ypos	double64	0.0-1.0
nrofalternatives	int32	0-10
Alternative sector	int32	0-25
Alternative multiplier	int32	0-3
Above 2 items repeated nrofalternatives times		

NetworkCharacteristic

Write

Join Wifi

name	type	value
messagetype	int32	1
ssid	byte[50]	string (trim space end)
password	byte[50]	string (trim space end)

Leave Wifi

name	type	value
messagetype	int32	2

Read

Returns the available wifi networks for the dartstracker.

name	type	value
hotspot	bool8	true/false
wifi	bool8	true/false
ssid	byte[32]	Ascii string 32 length
ip	byte[16]	Ascii string 16 length
hotspot	byte[32]	Ascii string 32 length
nrofssidsfound	int32	

ssid	byte[32]	Ascii string 32 length
signal	int32	1..5
Above 2 items repeated nrofssidsfound times		