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INUNDATIO

Automatización del modelado de riesgos de inundaciones en cabeceras de cuenca a través de técnicas de inteligencia artificial y Big Data

Proyecto SOE3/P4/E0929

E2.4.1 – Mapas interactivos de simulación de inundaciones en las cuencas seleccionadas. Requisitos de la aplicación Web.

Julio 2021

Contenido

1 Control de cambios

VERSIÓN	FECHA	SOCIO	MODIFICACIONES
V1.0	06/07/2021	ITCL	Versión inicial

2 Introduction

This document addresses the design and specifications for the web applications that are involved in the prediction of the state of the basin according to previous simulations. These web applications are:

- The web application for querying and browsing the estimated map of the basin.
- The web application for the configuration of the CBR.

For the former web application, there are two possible main views: when the user gets into the application for the first time (where no map is visualized as long no previous query has been made) and when at least one query has been submitted. Each of these cases are defined separately: **Section 3** describes the first one while **Section 4** describes the second. The flow chart is shown in the next figure, where the Initial Query Form allows to insert the first analysis to perform, while the working form is the responsible of visualizing the coloured map and requesting new queries as well.

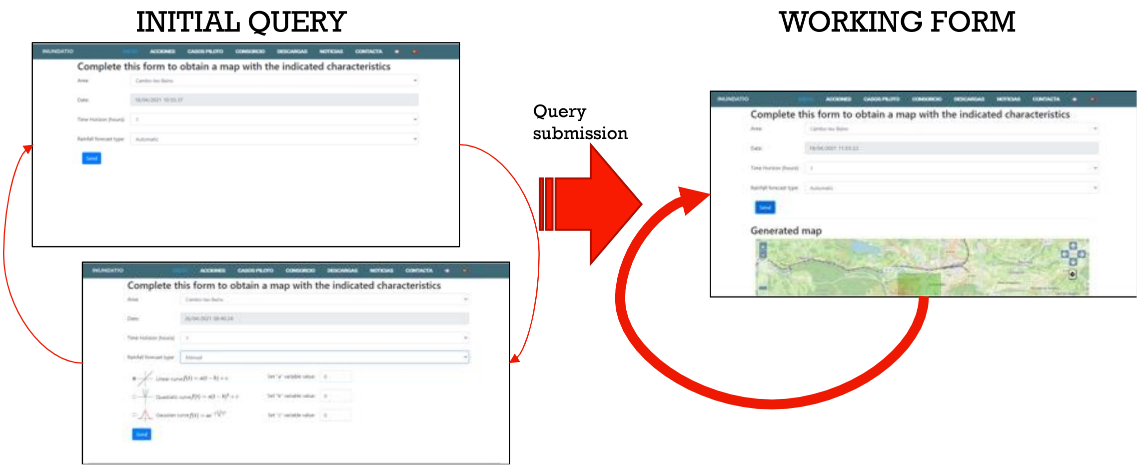

Figure 1 Query application, with the two available main views.

Besides, the CBR configuration web application is described in **Section 5**. As this is the core of the system, this web application is much more complex than the previous one, with several possible interfaces, with relationships and restrictions between them.

The next two sections are split in two: the ***prototype*** of the web application and then the ***requirements*** for the parameters, as well as the relationships and the restrictions between interfaces. However, the last section covering the CBR configuration will require a more complex structure to make everything clear.

3 INUNDATIO Flood Estimation Query App

This is the first access point that a user gets to see, that is, when a user gets to the INUNDATIO basin state prediction tool for the first time in the session, this is the presented interface.

3.1 Prototype

Figure 2 represents the initial form. Users can fill the fields to start a query for a specific basin and location estimation. The restrictions on the values are described in the requirements below.

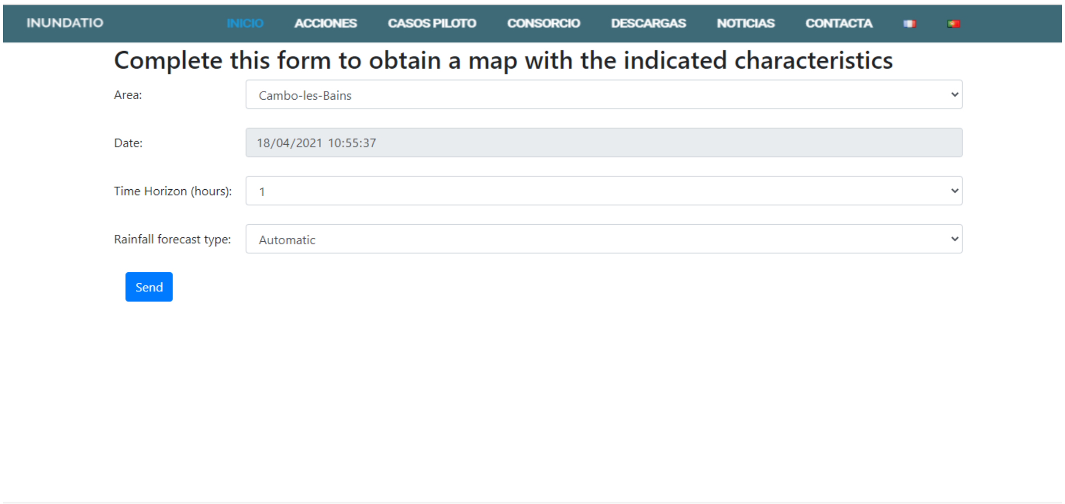

Figure 2 Query app screen.

When manual rainfall forecast is selected, the user needs to set the function and its parameters. In this case, the form takes the view in Figure 3.

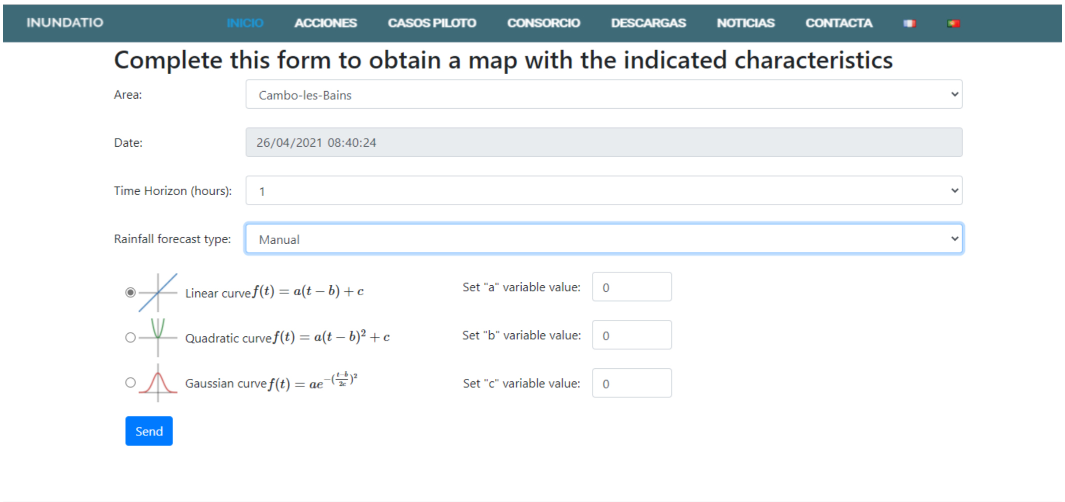

Figure 3 View of the form in case of manual rainfall forecast.

3.2 Requirements

FR1 Form basin area
The user must specify the basin area between the existing options. By default, French basin area 1 will be selected. Existing options are the following:

FR1.1 Cambo-les-Bains Nive basin option
Nive basin at Cambo-les-Bains

FR1.2 Osses Nive basin option
Nive basin at Osses

FR1.3 Venero-Claro option
Venero-Claro

FR1.4 Ribera da Vinhas option
Ribera da Vinhas

FR2 Form date
The date of the report will automatically set to the current date and time. It will not be possible to modify this date.

FR3 Form time horizon
The user must specify the Time Horizon for which the map should be displayed among the most used Time Horizons. The available options to be selected will be from 1 to 6 hours.
Default value will be 1.
Minimum value will be 1. Maximum value will be 6.

FR4 Form Rainfall Forecast
The user must select the Rainfall Forecast source among the following:

FR4.1 Automatic Rainfall Forecast configuration
Automatic Rainfall Forecast search from the pre-defined URL based on selected basin.

FR4.2 Manual Rainfall Forecast configuration
Manual Rainfall Forecast setting, with the following options:

FR4.2.1 Linear Rainfall Forecast behaviour
Linear behaviour, setting a time b for which the forecast would have value c plus the slope a.

$$f(t) = a(t - b) + c$$

Parameter	Default	minimum	maximum
a			
b			
c			

FR4.2.2 Quadratic Rainfall Forecast behaviour
Quadratic behaviour, setting the time of the inflection point b, the coefficient a and the shift c.

$$f(t) = a(t - b)^2 + c$$

Parameter	Default	minimum	maximum
a			

b			
c			

FR4.2.3 Gaussian Rainfall Forecast behaviour

Gaussian behaviour, setting the time of the center of the bell b, the standard deviation c and the coefficient a.

$$f(t) = ae^{-\left(t-b/_{2c}\right)^2}$$

Parameter	Default	minimum	maximum
a			
b			
C			

FR5 Form submit button

The user must click on the send button to submit the selected options and to retrieve a map with the estimation of the water level.

4 INUNDATIO Map Visualization App

Once the user has introduced and submitted a query, this is the normal interface that is displayed. This interface visualizes the coloured map but also allows the user to introduce new queries.

4.1 Prototype

Once the query has been made, a map will be generated for the selected area and with the selected characteristics; the generated map will be displayed in the same web page. It is worth noticing that the map might occupy a large part of a screen, although in Figure 4 a reduced map is shown for the sake of simplification. Interestingly, the users can start a new query just by setting the corresponding fields and sending the data again.

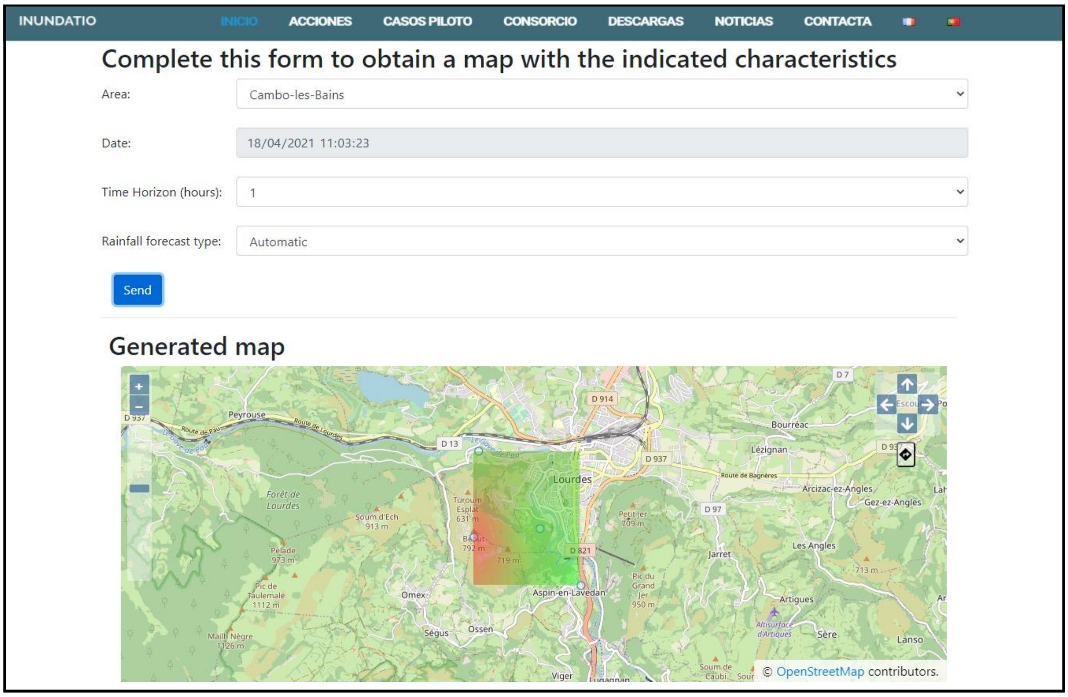

Figure 4. Generated map.

As it can be seen in Figure 4, the map will have a coloured area over a standard layer showing the flood risk. The user will be able to pan the map and zoom in and out as well. The small rectangle in colour, for a real scenario, will cover the complete area of study; this rectangle is just for the sake of illustration of the design.

4.2 Requirements

The same requirements for the query form hold for this interface, so they are not repeated. These are the specific requirements for the Map Visualization.

MVR1 Map visualization An image generated by the CBR service for the simulation conditions is visualized. This image is a coloured map of the basin according to the estimated water level. The map will have the next characteristics.
MVR1.1 Coloured map The map will be coloured representing the estimated water level in the basin.
MVR1.2 Heavy image download The interface should address the downloading of heavy images.
MVR1.3 Initial center point and zoom level The center and scale of the map will be set according to the selected basin. By default, it will be set to the center of the basin. The initial zoom should include the whole basin.
MVR1.4 Zoom options The user will be able to zoom in on the map in different ways.
MVR1.4.1 Zoom in with mouse wheel The user will be able to zoom in on the map turning the mouse scroll wheel in one direction.
MVR1.4.2 Zoom in clicking on “+” The user will be able to zoom in on the map by clicking on the “+” icon on the top left side of the map.
MVR1.4.3 Zoom in slider bar The user will be able to zoom in on the map by dragging up the vertical slider bar placed on the left side of the map.
MVR1.4.4 Zoom in keyboard The user will be able to zoom in on the map by using the “+” key on the keyboard only if the map has the browser focus.
MVR1.5 Zoom out The user will be able to zoom out on the map in different ways.
MVR1.5.1 Zoom out mouse wheel The user will be able to zoom out on the map turning the mouse scroll wheel in one direction.
MVR1.5.2 Zoom out clicking on “-“ The user will be able to zoom in on the map by clicking on the “-“ icon on the top left side of the map.
MVR1.5.3 Zoom out slider bar The user will be able to zoom out on the map by dragging down the vertical slider bar placed on the left side of the map.
MVR1.5.4 Zoom out keyboard The user will be able to zoom out on the map by using the “-“ key on the keyboard only if the map has the browser focus.
MVR1.6 Pan the map The user will be able to pan the map dragging the mouse pointer over it or clicking on the arrows that will be displayed at each direction of the map. Each arrow will move the map view in the direction it indicates.

MVR1.6.1 Extent limit when panning over the map The user will not be able to pan outside an extent limit specified by the CBR service in CBRR2.2.

5 INUNDATIO CBR Configuration App

This is the most complex interface as long as we can configure the CBR performance for each basin and location. This document will refer Deliverable E2.2.1 whenever needed to make things clear.

The CBR Configuration App is devoted to setting up all the parameters of the CBR for any of the available basin-location. Because the relationships and constraints between parameters, the CBR configuration is split in several parts and a specific flowchart (see Figure 5) must be followed in order to successfully set the CBR.

Figure 5. Sequence of forms to configure the CBR for a basin-location. The number inside the red boxes refers to the section where this part is explained.

Briefly speaking, the first thing is to select the basin and location to configure. Afterwards, each of the sensors deployed in the basin must be defined (its type, sensor ID, sampling frequency, URL source and the length of the intervals where the average of the values from the sensor is computed -either 15 minutes or 1 hour-). For each defined sensor type, it is time to set the aggregation -max or average-, if any, and the number of intervals to consider for this type of sensor. At this moment, it is possible then to define all the weights for the different intervals and sensors for the current basin-location. Next step is to set up the distance function and selection criteria for each possible time horizon. Then, the variable to adapt the CBR consensus to the current queried scenario would be defined. Finally, the merging and the extrapolation parameters need to be defined.

Importantly, the CBR configuration app structure is shown in Figure 6, where the basin and location are set at the top of the form, while each stage has its own tab. Due to the restrictions and constraints, some tabs might be disabled if some information is not yet defined for the current basin and location. So, the first stage is to select the basin and location, then the next stages should be followed.

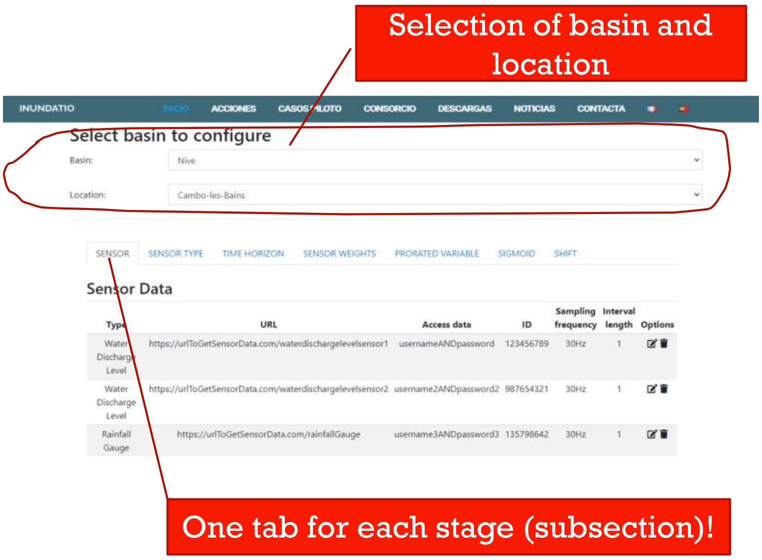

Figure 6. Structure of the CBR configuration App.

The next section deals with general requirements that are going to be used by all the web applications. Afterwards, each of the above-described stages has its own devoted subsection; the stages (and, therefore, the subsections) appears in the same order in which they should be fulfilled. Each of these subsections are split in two: the first one explains the interface of the prototype while the second focuses on the requirements.

5.1 General CBR Requirements

These requirements aim to define the interface with the Query web application and the General CBR parameters.

Parameters related with interfacing the Query web application:

CBRR1 CBR service input/output CBR service will receive the form values submitted in the FR5. Those values will be sent in JSON format. The JSON definition is specified in the next sub-requirements.

CBRR1.1 Basin and location property The area will be sent as a property with property name "location" and a string value corresponding to the selected basin and location.
CBRR1.2 Date property The date will be sent as a property with property name "date" and a string value representing the date.
CBRR1.3 Time horizon property The time horizon will be sent as a property with property name "timeHorizon" and an int value corresponding to the selected time horizon value.
CBRR1.4 Rainfall forecast mode property The rainfall forecast will be sent as a property with property name "isAutomatic" and a boolean value.
CBR1.4.1 Automatic rainfall forecast property If it is automatic the CBR service will request the defined rainfall forecast service associated the forecast report for the current location.
CBR1.4.2 Manual rainfall forecast property as object If it is not automatic the rainfall forecast will be sent as a JSON object named "rainfallForecast" including the properties specified next to build the chosen curve.
CBR1.4.2.1 Curve type The curve type will be sent as a property with property name "type" and a string value that will have to match the following options: • "Linear" • "Quadratic" • "Gaussian"
CBR1.4.2.2 Parameter a value This parameter value will be sent as a property with property name "parameter a" and an integer value.
CBR1.4.2.3 Parameter b value This parameter value will be sent as a property with property name "parameter b" and an integer value.
CBR1.4.2.4 Parameter c value This parameter value will be sent as a property with property name "parameter c" and an integer value.
CBRR2 CBR answer CBR service will return a JSON object containing the next information.
CBRR2.1 Image answer The image URL to load the image corresponding to the submitted parameters. The property name will be "urlImage" and the value will be a string containing the URL.
CBRR2.2 Map extent answer The map extent as a JSON object built of two properties. The first one named "width" with the extent width value and the second one named "height" with the extent height value.

Parameters related with the CBR basic configuration:

PCR1 General configuration User will be able to view and modify the following parameters listed below.
PCR1.2 Basin and location configuration Basin and Location pair of values
PCR1.2.1 Basin and location type Basin and Location are string values.
PCR1.2.2 Basin and location possible values Possible pair of values are: Nive-Osses, Nive-Cambo-les-Bains, Venero Claro-*LOCATION* Ribera da Vinhas-*LOCATION*.
PCR1.3 Prediction horizon configuration Prediction Horizon
PCR1.3.1 Prediction horizon units The prediction horizon UNITS as an Enumeration with possible values "HOURS".
PCR1.3.2 Prediction horizon type The prediction horizon is an integer value.
PCR1.3.3 Prediction horizon min The prediction horizon min is 1 when the prediction horizon units is set to HOURS.
PCR1.3.4 Prediction horizon max The prediction horizon max is 6 when the prediction horizon units is set to HOURS.
PCR1.4 Type of sensors configuration Type of sensors
PCR1.4.1 Type of sensors type The values are strings.
PCR1.4.2 Type of sensors options The tuples to include are "RG", "WDL" and "RF"
PCR1.5 Distance function configuration Distance function
PCR1.5.1 Distance function value type The values are strings.
PCR1.5.2 Distance function options The tuples are "Weighted Sum", "Sobol Indexes".
PCR1.6 Case selection criteria Selection criteria

	PCR1.6.1 Selection criteria value type The values are strings.
	PCR1.6.2 Types of case selection criteria The tuples are “Minimizing a Single criteria”, “Pareto dominance”. Choosing “Pareto dominance” implies using the “Weighted Sum” distance.

5.2 Configuration of the sensors deployed in a basin-location

This represents the starting point in setting the CBR for a specific basin and location: defining all the sensors that are deployed in the area. This accomplishes the case description described in Deliverable E2.2.1, section 3.3.

5.2.1 Prototype

Figure 7 shows the interface designed for the sensor definition; notice that a specific basin and location has been already introduced. Thus, for each sensor, the following information must be given:

- Sensor type: available sensor types are Water Discharge Level, Rain Gauge and Rain Forecast.
- The source of data URL: where the data from the sensor can be retrieved.
- The data access information: basically, the username and password for accessing the data source.
- Sensor Id. This is the corresponding sensor id in the data service.
- Sampling frequency, in Herz.
- Interval length: an interval is just a period of time where the values for the corresponding sensor will be averaged. This length can be either 1 hour or 15 minutes.

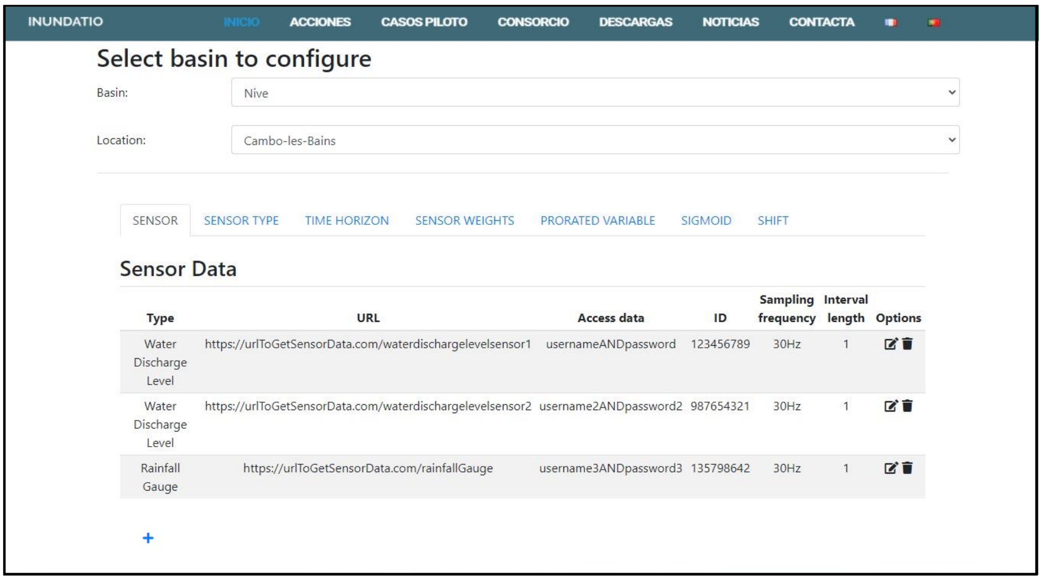

Figure 7. Sensor configuration screen.

Possible actions include adding, editing or deleting items from the list of deployed sensors just by clicking in the + button or in the corresponding icon. While adding a new sensor all the values are checked and validated before storing in the data base. When editing the information from a sensor, the save button should be clicked in order to store the new values.

5.2.2 Requirements

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.1 Sensor configuration Each sensor used in a basin-location pair should be defined by including the following information
PCR2.1.1 Sensor basin-location configuration Sensor Basin-Location pair, automatically set in coherence with current basin-location
PCR2.1.2 Sensor type configuration Sensor type that will match sensor types defined in PCR1.4
PCR2.1.3 Sensor URL configuration Sensor URL as a string value
PCR2.1.4 Sensor data access configuration Sensor data access and login info as a string value
PCR2.1.5 Sensor ID in database configuration Sensor ID as a string value
PCR2.1.6 Sensor sampling frequency configuration Sensor sampling frequency as an integer value
PCR2.1.7 Sensor interval length configuration Sensor interval length (hour/15minutes)

5.3 Sensor aggregation and number of intervals

In the previous stage all the sensors deployed in a location were defined. Thus, there will be several sensor types available for the location. This stage aims to define two main parameters for each defined sensor type:

- Number of intervals.
- Aggregation mode.

An interval is just a time period for which the samples from a sensor are retrieved and averaged; the interval length defined in the previous stages for the basin-location as 1hour or 15 minutes. A common assumption derived from the CBR specification in Deliverable E2.2.1 is that the sensors belonging to the same type shares the same number of intervals. Thus, when a number of intervals is set to 3 then, for any sensor of this type, the averages of the values of the sensor for the last 3 intervals are computed.

The aggregation mode marks how all the sensors of the corresponding sensor type are considered. When the sensor type's aggregation mode is set to 'NONE, each sensor of this type is considered individually: a set of n weights must be defined then for each sensor of this type (with n being the number of intervals). However, when the aggregation is set to 'Max' or to 'Avg, then the intervals are calculated by aggregating the values from all the sensors of this type: the first interval will be the Maximum (or the Average) of the first interval from all the sensors of this type, and so on.

5.3.1 Prototype

Figure 8 shows the basic interface. As it can be seen, only the sensor types are included, one per row. For each of them, the number of intervals and the aggregation mode are defined.

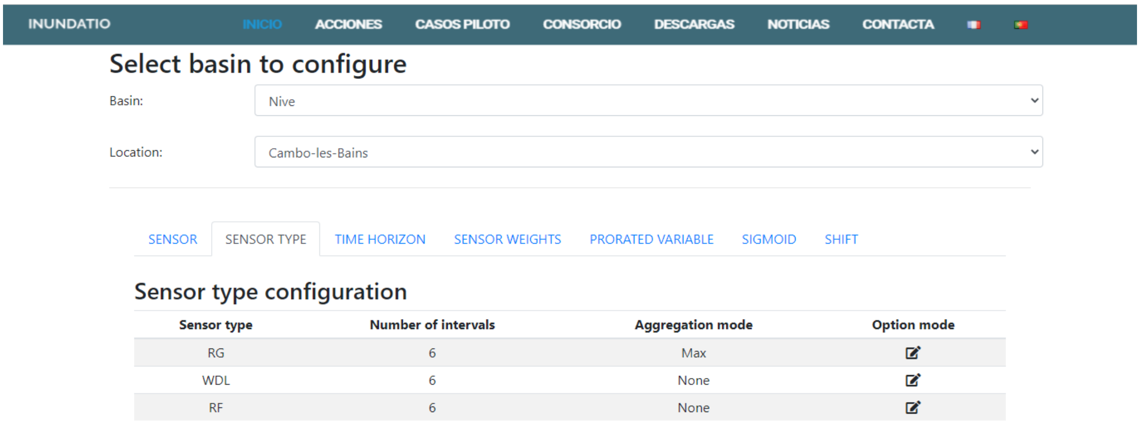

Figure 8. Sensor type configuration screen.

5.3.2 Requirements

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.3 Number of samples and aggregation method
PCR2.3.1 Type of sensor configuration For each type of sensor defined in PCR1.4.2 (see PCR1.4.2 Type of sensors options) the number of 1-hour (or 15 minutes in case of the Portuguese basin) intervals is defined and how to aggregate them.
PCR2.3.1.1 Number of aggregated intervals The amount of 1-hour (or 15 minutes in case of the Portuguese basin) intervals will be an integer value.
PCR2.3.1.2 Aggregation configuration If sensor type is "RG" possible values are "Max" and "Avg". For every other sensor type no aggregation is performed ("NONE").

5.4 Prediction Horizon configuration

The prediction horizon is part of the query to the CBR and refers to the number of hours ahead that the CBR must predict the behaviour of the basin-location. According to Deliverable E2.2.1, the maximum value for the prediction horizon is 6 (see Requisite PCR1.3), thus any prediction horizon from 1 (PCR1.3.3 Prediction horizon min) to 6 (PCR1.3.3 Prediction horizon max).

To make the CBR more flexible and adaptable, each time horizon can have its own parameters related with how the CBR will take decisions, in other words, how to select the most relevant cases from the case base for the current prediction horizon. For more information, see 3.4 Retrieving cases and 3.5 Case retrieval and reuse (Deliverable E2.2.1).

The parameters that will be possible to update are the listed next:

- Selection mode: can be either “Distance Threshold” or “Number of neighbours”.
- Number of neighbours: an integer with the number of closest cases to retrieve.
- Distance threshold: a distance threshold value for which cases with larger distance with the current case are not retrieved.
- Distance function or Criteria evaluation: taken either “Weighted sum” or “Sobol Indexes”. This parameter refers to the distance function to be used in measuring the distance between the current case and any case in the case base.
- Selection criteria: options are “Minimizing a Single criteria” and “Pareto dominance”. With the former, a linear combination of all the sensors is calculated and this value is used to decide whether a case is retrieved or not. When Pareto dominance is selected, then the distance is computed for each sensor type when aggregated or for each individual sensor when its type is has aggregation mode set to ‘None’. Thus, several dimensions are available and the Pareto dominance criteria is used.

It is worth mentioning that choosing “Pareto dominance” as selection criteria implies choosing “Weighted sum” as a distance function.

5.4.1 Prototype

The interface for introducing the prediction horizon configuration is depicted in Figure 9, where each possible value of prediction horizon (from PCR1.3.3 Prediction horizon min to PCR1.3.3 Prediction horizon max) needs a row.

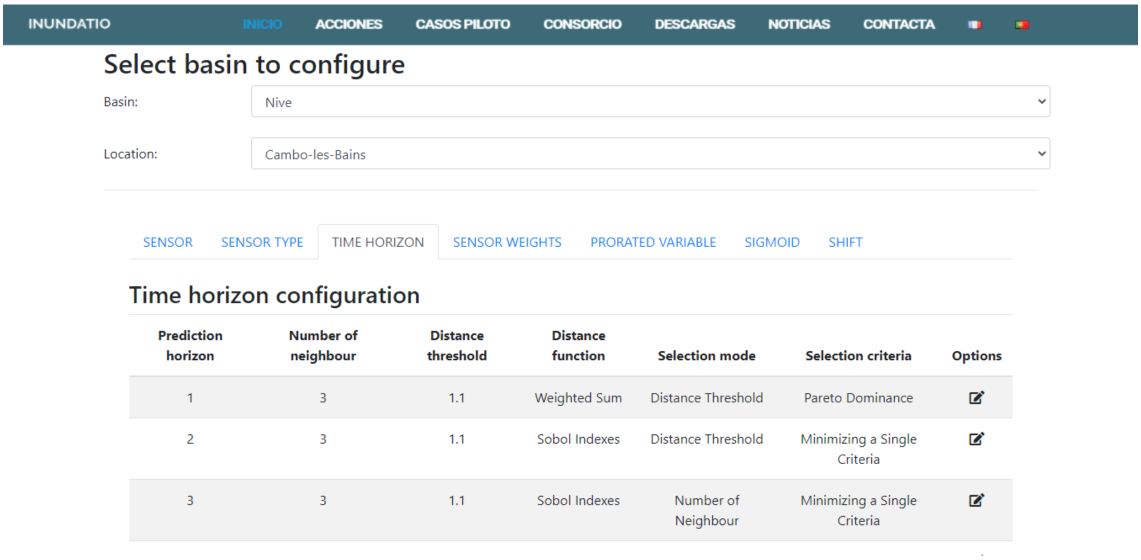

Figure 9. Prediction horizon configuration screen.

5.4.2 Requisites

This configuration screen is related to PCR2.2 requirement where every parameter is described.

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.2 For each prediction Horizon configuration For each possible Prediction Horizon from Prediction Horizon Min to Prediction Horizon Max
PCR2.2.1 Criteria configuration Criteria definition
PCR2.2.1.1 Selection mode configuration Selection Mode, a value between “number of nearest neighbours” and “using a distance threshold”
PCR2.2.1.2 Number of neighbour configuration Number of neighbour cases as an integer value
PCR2.2.1.3 Neighbourhood distance threshold configuration Neighbourhood distance threshold as an integer value
PCR2.2.1.4 Distance function Distance function from PCR1.5 (see PCR1.5 Distance function configuration)
PCR2.2.1.5 Sensor interval configuration For each defined sensor, for each sensor interval

5.5 Sensor weights

As stated in form in Section **Erreur ! Source du renvoi introuvable.**, the number of considered intervals varies for each sensor type; for the French and Spanish basins, the intervals are of 1 hour wide, while for the Portuguese one the intervals extend during 15 minutes.

We can represent, thus, each aggregated sensor type or each individual sensor as a vector of size the corresponding number of considered intervals. Therefore, a set of weights must be defined for each aggregated sensor and for each individual sensor.

Furthermore, the behavior of the basin varies with the time prediction horizon; that is, the relationships among the variables may vary from one prediction horizon to other. As a consequence, a different set of weights should be given for each of the possible time prediction horizons.

All these weight sets will be used in computing the distance between cases in the retrieval stage of the CBR and in the selection of the most relevant cases.

Each weight value will be a real number in [0.0, 1.0]. As mentioned before, the number of weights per variable (an aggregated sensor type or an individual sensor) is the number of intervals defined in Section 5.3.

5.5.1 Prototype

The following Figure shows the weights of several sensors for a specific time horizon. When a sensor has less useful intervals than the maximum, then the row of weights are completed with zeros.

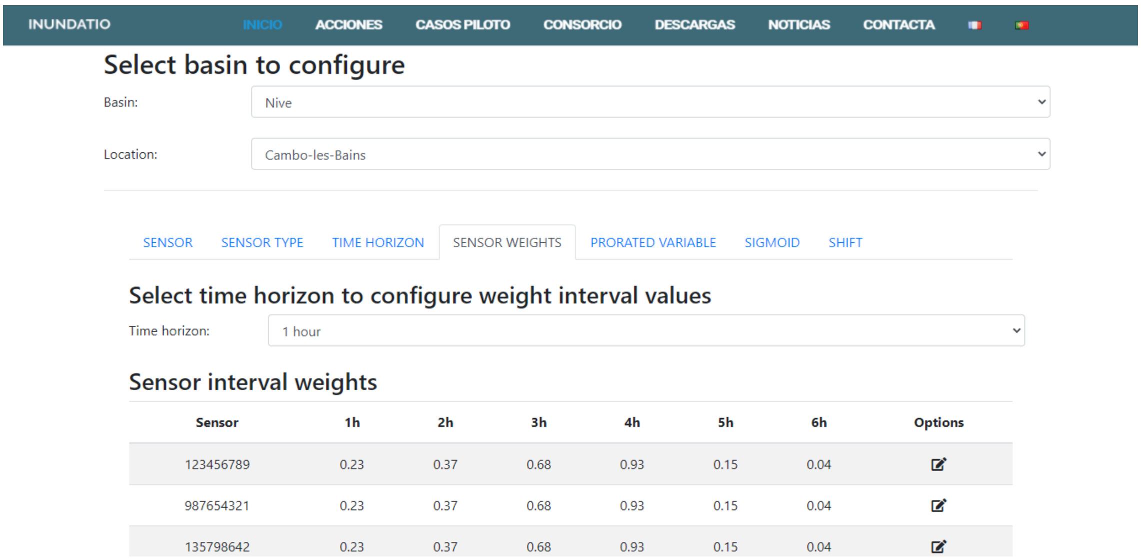

Figure 10. Sensor weights configuration screen.

5.5.2 Requisites

This configuration screen is associated with PCR2.2.1.5.1 Sensor interval weight.

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.2 For each prediction Horizon configuration For each possible Prediction Horizon from Prediction Horizon Min to Prediction Horizon Max
PCR2.2.1 Criteria configuration Criteria definition
PCR2.2.1.5 Sensor interval configuration For each defined sensor, for each sensor interval
PCR2.2.1.5.1 Sensor interval weight Sensor Interval weight as a float value between 0 and 1

5.6 Current scenario prorated variable

The current scenario variable configuration screen contains a dropdown menu with three options that are "Water Discharge Level", "Rainfall gauges" and "Rainfall forecast". This selection defines in which dimension to consider in the adaptation of the solution proposed by the CBR. Once selected, the specific sensor to use in the adaptation must be defined as well.

A change in the selected options will trigger an event that will upload its value in the database.

Just after the retrieval and selection of the relevant cases, the CBR produces a solution for the current scenario; this solution must be adapted to the current scenario in order to consider out of the limit's circumstances. The current scenario variable is the dimension in which the adaptation shift described in the CBR description document (Deliverable E2.2.1, section 3.6 Fusion of candidates) will be applied. For the Spanish and French basins, this variable will be "Water Discharge Level"; for the Portuguese basin, it will probably be the same but it might vary due to the basin conditions.

By default, it is set to "Water Discharge Level".

5.6.1 Prototype

Figure 11 depicts the selection of the prorated variable. The first considered option is which dimension is used among those defined in the basin and location. Basically, it is the Water Discharge Level, but can be any of the possible sensor types.

The second option is to select one of the deployed sensors -when the dimension is not aggregated (see Section 5.3)- among those of the chosen dimension. This would be the pro-rated variable.

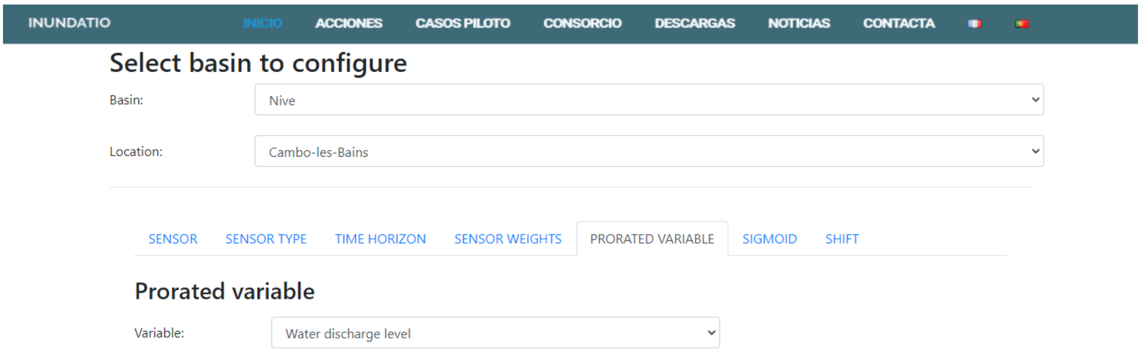

Figure 11. Prorated variable configuration screen.

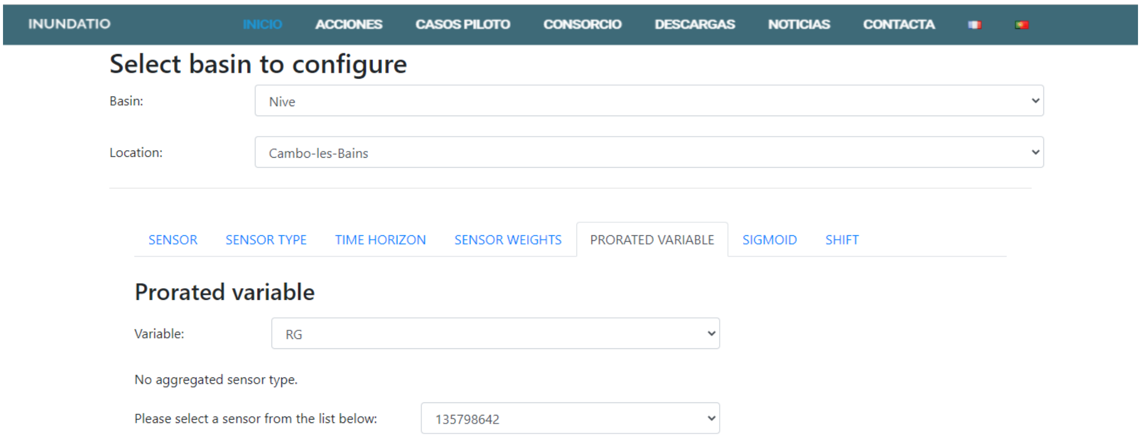

Figure 12. Prorated variable when the dimension is not aggregated configuration screen.

5.6.2 Requisites

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.2 For each prediction Horizon configuration

For each possible Prediction Horizon from Prediction Horizon Min to Prediction Horizon Max
PCR2.2.2 Current scenario variable configuration Current scenario prorated variable
PCR2.2.2.1 Selected variable configuration Variable (set to one of the available sensor types for the basin-location-prediction horizon tuple)

5.7 Case adaptation's Sigmoid parameters

Once selected the variable to use in the adaptation of the CBR solution to the current scenario, the next step is to determine how the adaptation of the centroid of the relevant cases to the current scenario is computed. The deliverable E2.2.1, in its section 3.6 Fusion of candidates, proposed to compute this weight based on a Sigmoid function. Thus, this part of the CBR configuration application is devoted to define the parameters for the Sigmoid function.

The minimum distance among the retrieved cases and the current scenario is found. This minimum distance and the current scenario is multiplied by a ***Delta*** constant and used as the input of a Sigmoid function; the output of the function f_S is the weight by which the current scenario pro-rated variable must be multiplied, while the centroid variable must be multiplied by $max(0, 1-f_S)$.

The Sigmoid function equation is shown below, with a, b, c being the real numbers to set in this CBR configuration's tab:

$$f(dist) = c\frac{1}{1 + e^{-b(dist-a)}}$$

The related requirement where each column is described is PCR2.2.3.

5.7.1 Prototype

Each time prediction horizon has an associated row, each row includes the a, b, c and Delta parameters for the corresponding prediction horizon.

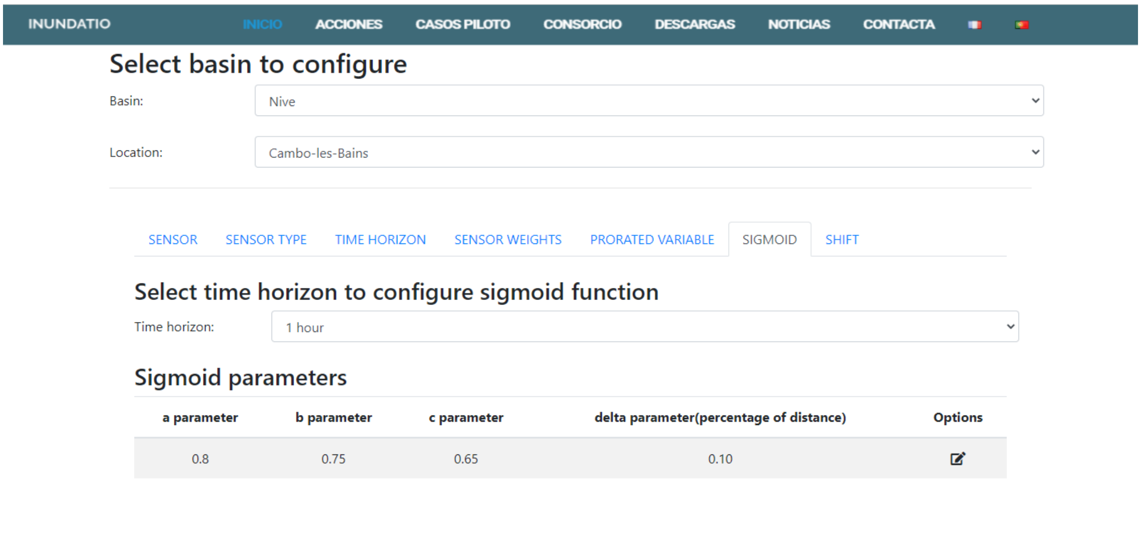

Figure 13. Sigmoid function configuration screen.

5.7.2 Requisites

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.2 For each prediction Horizon configuration For each possible Prediction Horizon from Prediction Horizon Min to Prediction Horizon Max
PCR2.2.3 Sigmoid function configuration Sigmoid function variables
PCR2.2.3.1 Variable “a” configuration The “a” variable as a float value
PCR2.2.3.2 Variable “b” configuration The variable b as a float value
PCR2.2.3.3 Variable “c” configuration The c variable as a float value
PRC2.2.3.4 Percentage of distance configuration Δ_{WDL}, the percentage of distance between centroid and current case for which the sigmoid has value, an integer value by default set to 10%

5.8 Extrapolation Shift parameters

The final step is to determine how the changes in the outcome due to the previous stage are updated to each point in the basin. The simple solution used in the CBR (see Section 3.6 in the CBR definition, Deliverable E2.2.1) is a linear combination between the most relevant point in the basin and the upper bound in the height considered for the basin-location; this linear combination is computed for each point in the basin using the following equation:

$$PS = \frac{(PH - LH)}{(MH - LH)} \times (MHS - LS) + LS$$

In this equation, PH stands for the current point's height, LH represents the lowest basin height, MH is the basin maximum considered height and MHS is the maximum allowable height shift to introduce due to the adaptation.

Again, each time prediction horizon has its own set of values.

5.8.1 Prototype

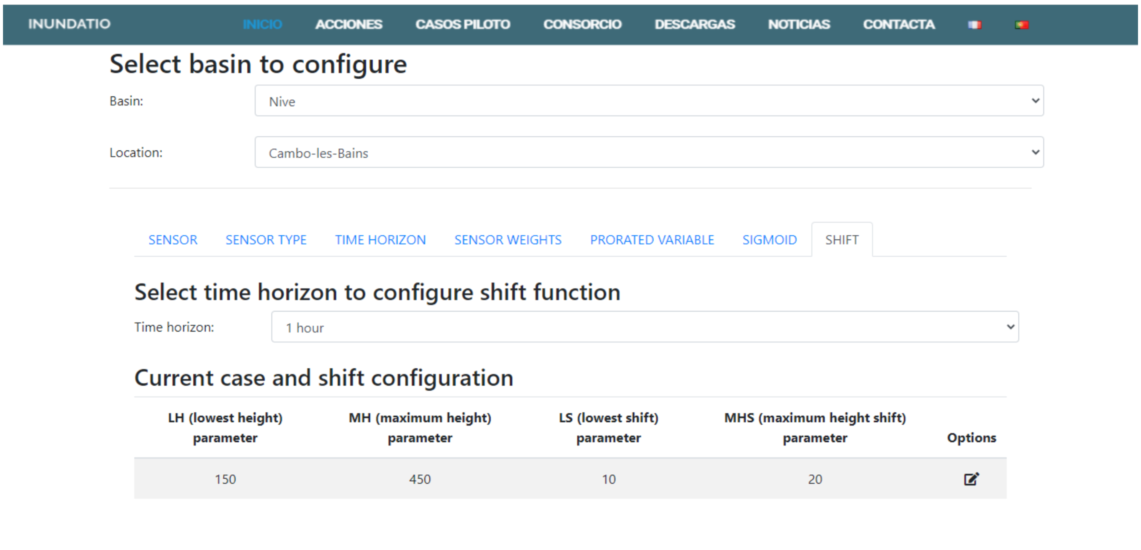

Figure 14. Shift configuration screen.

5.8.2 Requirements

The related requirements for the extrapolation shift parameters are described in PCR2.2.4.

PCR2 Basin location pair configuration For each basin-location pair, the user will be able to view and modify the following parameters listed below.
PCR2.2 For each prediction Horizon configuration For each possible Prediction Horizon from Prediction Horizon Min to Prediction Horizon Max
PCR2.2.4 Current case and shift configuration Prorating to the current case and computing the shift for every point in the basin
PCR2.2.4.1 PH configuration PH, the current basin point height, as an integer value greater than 0.

	PCR2.2.4.2 LH configuration LH, the lowest basin height as an integer value greater than 0 and equals or lower than PH
	PCR2.2.4.3 MH configuration MH, the maximum basin height as an integer value greater than PH
	PCR2.2.4.4 MHS configuration MHS, the maximum height shift as a float value
	PCR2.2.4.5 LS configuration LS, the lowest height shift as a float value