

```
fn make_fully_adaptive_composition
```

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This proof resides in “**contrib**” because it has not completed the vetting process.

Proves soundness of `fn make_fully_adaptive_composition`.

## 1 Hoare Triple

### Precondition

## Compiler-verified

- Argument `input_domain` of type `DI`.
- Argument `input_metric` of type `MI`.
- Argument `output_measure` of type `MO`.
- Generic `DI` implements `Domain`.
- Generic `MI` implements `Metric`.
- Generic `MO` implements `CompositionMeasure`.
- `(DI, MI)` implements `MetricSpace`.

## Caller-verified

None

## Pseudocode

```

1 def make_fully_adaptive_composition(
2     input_domain: DI,
3     input_metric: MI,
4     output_measure: MO,
5 ) -> Odometer[DI, MI, MO, Measurement[DI, MI, MO, TO], TO]:
6
7     # check if fully adaptive composition is supported
8     output_measure.composability(Adaptivity.FullyAdaptive)
9
10    def function(
11        arg: DI_Carrier,
12    ) -> OdometerQueryable[Measurement[DI, MI, MO, TO], TO, MO_Distance]:
13        return new_fully_adaptive_composition_queryable(
14            input_domain, input_metric, output_measure, arg
15        )
16
17    return Odometer.new(

```

```

18         input_domain, input_metric, output_measure, Function.new_fallible(function)
19     )

```

## Postcondition

**Theorem 1.1.** For every setting of the input parameters (`input_domain`, `input_metric`, `output_measure`, `DI`, `MI`, `MO`, `TO`) to `make_fully_adaptive_composition` such that the given preconditions hold, `make_fully_adaptive_composition` raises an error (at compile time or run time) or returns a valid odometer. A valid odometer has the following properties:

1. (Data-independent runtime errors). For every pair of members  $x$  and  $x'$  in `input_domain`, `invoke(x)` and `invoke(x')` either both return the same error or neither return an error.
2. (Valid odometer queryable). For every member  $x$  in `input_domain`, where `function(x)` does not raise an error, `function(x)` returns a valid odometer queryable.

*Proof of data-independent errors.* Errors are data-independent by the the postcondition of `new_sequential_odometer_queryable`. □

*Proof of valid odometer queryable.* Under the assumption that the input data is a member of the input domain, the precondition of `new_fully_adaptive_composition_queryable` is met, so by its postcondition the return is a valid odometer queryable. □