leigqNEWTON_sphere_detect

User-facing entry point for detecting candidate eigen-spheres.

Internally this is a thin wrapper around `leigqNEWTON_sphere_sample` with a default progress report (unless you set `'Report','off'`).

This page uses a short "doc profile" and prints what was found.

NOTE (documentation profile)

This live-script source is designed to be **fast and quiet** by default. It demonstrates the API of the documented function without running long sphere-hunting loops. For more reliable (but slower) settings, see the "RELIABLE profile" section near the end of this page.

The examples require MATLAB's built-in quaternion class.

Requirements and path

```
hasQuat = true;
try
    quaternion(0,0,0,0);
catch
    hasQuat = false;
end
if ~hasQuat
    disp("This toolbox requires MATLAB's built-in quaternion class
(quaternion(w,x,y,z)).");
    return;
end
if exist('leigqNEWTON_sphere_detect','file') ~= 2
    error('leigqNEWTON_sphere_detect not found on the MATLAB path. Add the toolbox
root folder.');
end
```

Test matrix with a known eigen-sphere (2x2)

```
qi = quaternion(0,1,0,0);
A  = [ quaternion(2,0,0,0),  qi;
      -qi,                quaternion(2,0,0,0) ];
```

Doc profile (fast)

```
Collect  = 10;
RunsMax  = 20;
Restarts = 80;

[lamAll, lamS, lam0, cls, sph, info] = leigqNEWTON_sphere_detect( ...
    A, 'Collect',Collect, 'RunsMax',RunsMax, 'Restarts',Restarts, ...
```

```
    'Seed0',1, 'Report','summary');
```

```
=== leigqNEWTON_sphere_sample summary ===
 n = 2
 runs used = 5
 distinct samples = 10
 counted K (incl. zero multiplicity) = 10
 zero multiplicity (verified) = 0
 spheres found = 1
  sphere 1: center~(2,7.214e-13,6.656e-13,1.068e-12), r~1, inliers=10
 remaining (unclassified) distinct samples = 0
 note: Sphere detection completed (DISTINCT samples).
```

```
fprintf('Distinct samples: %d, counted list: %d, spheres found: %d\n', numel(lamS),
numel(lamAll), ~isempty(sph));
```

```
Distinct samples: 10, counted list: 10, spheres found: 1
```

```
if ~isempty(sph)
    disp(sph);
end
```

```
    center4: [2.0000 7.2145e-13 6.6558e-13 1.0677e-12]
     center: [1×1 quaternion]
     radius: 1.0000
   basis4x3: [4×3 double]
         p0: [1.8931 1.2789e-18 0.8512 0.5139]
    center3: [3×1 double]
    inliers: [10×1 double]
   samples4: [4×1 quaternion]
    sampler: @(theta,phi)local_sphere_sampler(model,theta,phi)
```

RELIABLE profile (optional, slower)

```
RUN_SPHERE_DETECT_RELIABLE = false;
try
    RUN_SPHERE_DETECT_RELIABLE = evalin('base','RUN_SPHERE_DETECT_RELIABLE');
catch
end
if RUN_SPHERE_DETECT_RELIABLE
    disp('RELIABLE profile: this may take minutes.');
    [lamAll, lamS, lam0, cls, sph, info] = leigqNEWTON_sphere_detect( ...
        A, 'Collect', 40, 'RunsMax', 120, 'Restarts', 600, 'Seed0', 1,
'Report','progress');
    disp(sph);
end
```

See also

leigqNEWTON_sphere_sample, leigqNEWTON_sphere_validate, leigqNEWTON_sphere_refine